February 1961

Panel discusses track surfacing

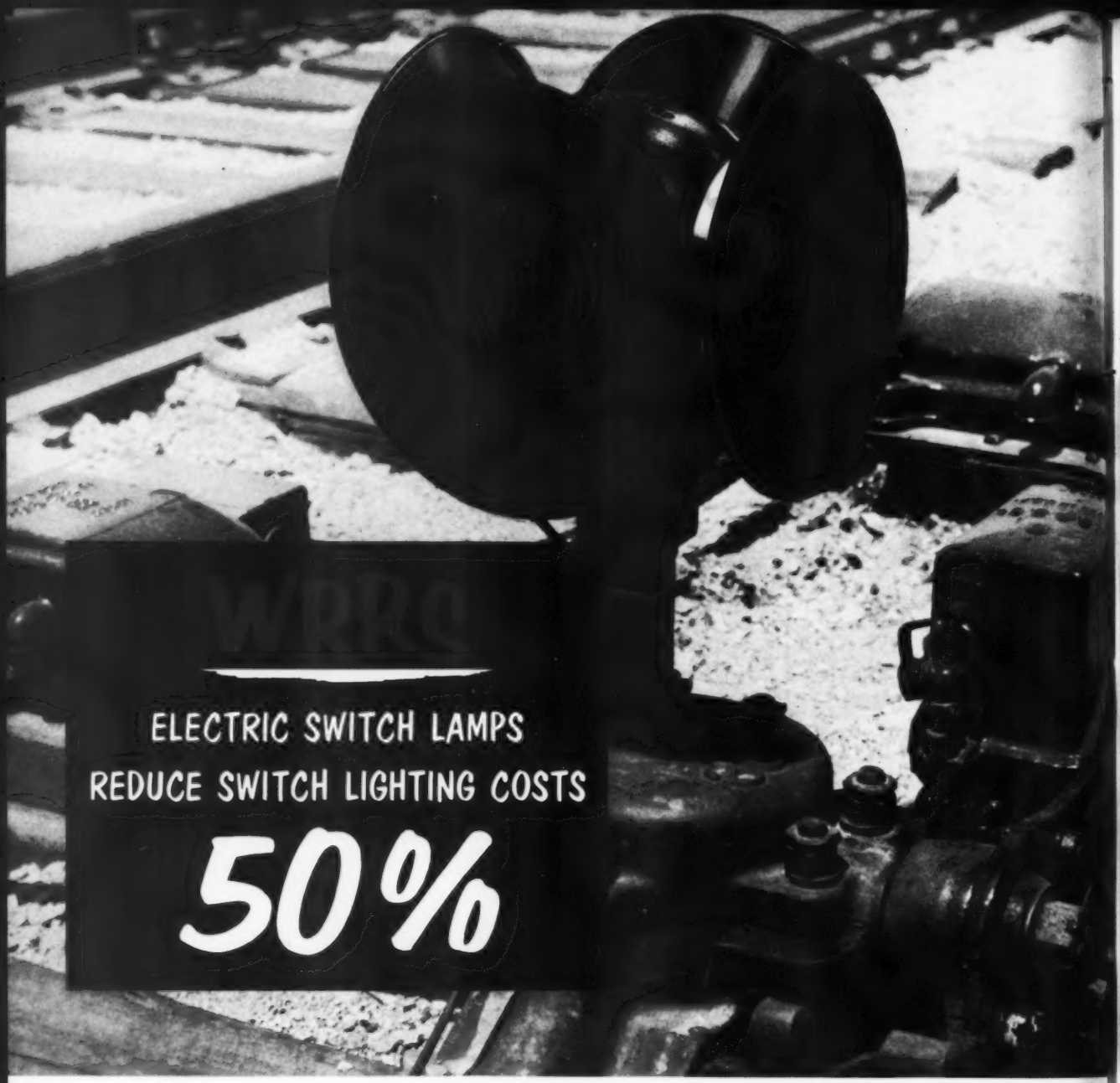
p. 20

railway TRACK and STRUCTURES

Research points way to larger metal culverts

p. 19

A Simmons-Boardman TIME-SAVER Publication



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Features

Departments

Don't miss . . .

Complete list of exhibitors plus other useful information about the exhibition to be sponsored by the National Railway Appliances Association at McCormick Place, Chicago, in conjunction with AREA meeting.

. . . in the March issue

NEWS ABOUT PEOPLE

BURLINGTON—**W. R. Holler,** track supervisor at West Quincy, Mo., has been promoted to roadmaster at Hannibal, Mo., succeeding **J. L. Mason** who retired recently after 38 years of service.

CANADIAN NATIONAL—Incident to a reorganization of this company's territorial setup, **W. E. Griffiths,** chief engineer of the Central Region at Toronto, has been appointed chief engineer, of the new Great Lakes Region, with the same headquarters. **B. Chappell,** chief engineer of the Western Region at Winnipeg, Man., has been appointed chief engineer of the new Prairie Region.

Other changes have been made as follows: **R. L. Gray,** district engineer at Capreol, Ont., to area engineer, Northern Ontario Area, at Capreol; **W. J. Wanamaker,** assistant to chief engineer at Toronto, to area engineer, London Area, at London, Ont.; and **R. G. Moffatt** to area engineer, Toronto Area, at Toronto.

John S. McGuire, assistant superintendent work equipment at Toronto, has been promoted to superintendent of the Stratford shops, succeeding **Walter W. Wynne** who has been promoted to superintendent work equipment, St. Lawrence Region, at Montreal. Other changes include the following: **G. N. McLennan,** engineer work equipment, Western Region, to superintendent work equipment, Western Region; **D. M. McNaughton,** superintendent work equipment at Winnipeg, to assistant superintendent work equipment; and **W. R. Windeatt,** regional supervisor work equipment shops, to assistant superintendent work equipment shops.

CANADIAN PACIFIC—**R. A. Spencer,** assistant engineer, Laurentian division, has been promoted to assistant division engineer, Montreal Terminals division, succeeding **W. M. Price** who has been appointed supervisor, maintenance of way, at Montreal. Mr. Price succeeds **J. Fox** who has been appointed assistant engineer, Atlantic Region, at Montreal, succeeding **A. G. Hibbard** who is on leave of absence.

CHESAPEAKE & OHIO—**Patrick B. Roberson,** assistant engineer at Richmond, Va., has been promoted to assistant cost engineer.

DELEWARE & HUDSON—**C. L. Kingsbury** has been appointed assistant supervisor work equipment at Colonie, N. Y., succeeding **E. E. Norton,** retired.

DETROIT & MACKINAC—**J. G. Campbell,** general superintendent, Tawas City, Mich., and formerly superintendent of maintenance, has been elected vice president and assistant general manager, effective January 1, with the same headquarters.

FRISCO—**M. L. Thornbrough,** assistant engineer at Enid, Okla., has been promoted to supervisor track and structures on the Alabama, Tennessee & Northern, a subsidiary of the Frisco, at York, Ala., succeeding **D. F. Richardson** who has been promoted to roadmaster at Chaffee, Mo.

ILLINOIS CENTRAL—**D. C. Layman,** general foreman bridges and buildings at Jackson, Tenn., has been promoted to supervisor bridges and buildings at Paducah, Ky., succeeding **R. E. Downard** whose death is noted elsewhere on this page.

P. H. Croft, Jr. supervisor of trains and track at Kankakee, Ill., has been transferred to Durant, Miss., and the position of supervisor of trains and track at Kankakee has been abolished.

NEW YORK CENTRAL—**B. J. Gordon,** assistant district engineer at Syracuse, N. Y., has been promoted to district engineer at New York. **Russell C. Heckel,** designer at Jackson, Mich., has been promoted to assistant engineer grade crossings at Chicago.

NORFOLK & WESTERN—**Cecil M. Johnson,** assistant roadmaster at Portsmouth, Va., has been promoted to roadmaster at Fort Gay, W. Va., succeeding **R. E. Barnett** who has been transferred to Altavista, Va. Mr. Barnett succeeds **J. L. Wallace** who has retired after 35 years of service. Mr. Johnson is succeeded by **B. S. Sands,** assistant roadmaster at Williamson, W. Va.

SEABOARD—**Howard Watts, Jr.,** assistant division engineer at Jacksonville, Fla., has been promoted to principal assistant division engineer at Tampa, Fla., succeeding **J. J. Vereen, Jr.,** who has been transferred to Raleigh, N. C. Mr. Watts is succeeded by **A. W. Cooper,** assistant engineer at Savannah, Ga. **A. B. Merrit., Jr.,** assistant engineer at Raleigh, has been promoted to assistant to division engineer there.

SOO LINE—Following merger of the Minneapolis, St. Paul & Sault Ste. Marie, the Wisconsin Central and the Duluth, South Shore & Atlantic into a single company to be known as the Soo Line Railroad Company, **Thomas R. Klingel,** chief engineer of the MStP&SSM, was appointed vice president, operations and maintenance, of the new company. **Arthur S. Krefting,** assistant chief engineer—bridges and structures of the old Soo Line, has been appointed chief engineer of the merged lines.

Other top engineering officers of the new Soo Line include **Raymond C. Postels,** assistant chief engineer, maintenance of way; **A. Donald Alderson,** assistant chief engineer, bridges and structures; and **Godfrey H. McMillan,** assistant to chief engineer. Messrs. Postels, Alderson and McMillan were previously engineer maintenance of way, assistant to chief engineer and engineer bridges and structures, respectively, of the MStP&SSM.

SOUTHERN—**Robert W. Fondren,** supervisor bridges and buildings at Greenville, S. C., has been promoted to division engineer there, succeeding **A. E. Chambers** who has been promoted to division engineer at Winston-Salem, N. C. Mr. Chambers succeeds **Hubert L. Rose** who has been transferred to Greensboro, N. C. **Warren L. Chestnutt,** track supervisor at Spartanburg, S. C., has been promoted to supervisor bridges and buildings at Greenville, S. C., succeeding Mr. Fondren.

Frederick D. Terry, Jr., has been appointed supervisor track at Jesup, Ga., succeeding **O. L. Lunsford, Jr.,** who has been transferred to Rockmart, Ga. Mr. Lunsford succeeds **Lee K. Walker** who has been transferred to Gate City, Va. **Hazel M. Mays,** assistant track supervisor at Greensboro, N. C., has been promoted to supervisor track at Durham, N. C.

SOUTHERN PACIFIC—**Paul B. Adams** and **Robert S. Kilpatrick,** water and fuel supervisors at West Oakland, Calif., and San Francisco, respectively, have been promoted to general water and fuel supervisors, both with headquarters at San Francisco.

Obituary

A. J. Wright, roadmaster on the Chicago, Burlington & Quincy at Casper, Wyo., died on December 16 at the age of 63.

R. E. Downard, 62, supervisor bridges and buildings on the Illinois Central at Paducah, Ky., died on December 4.

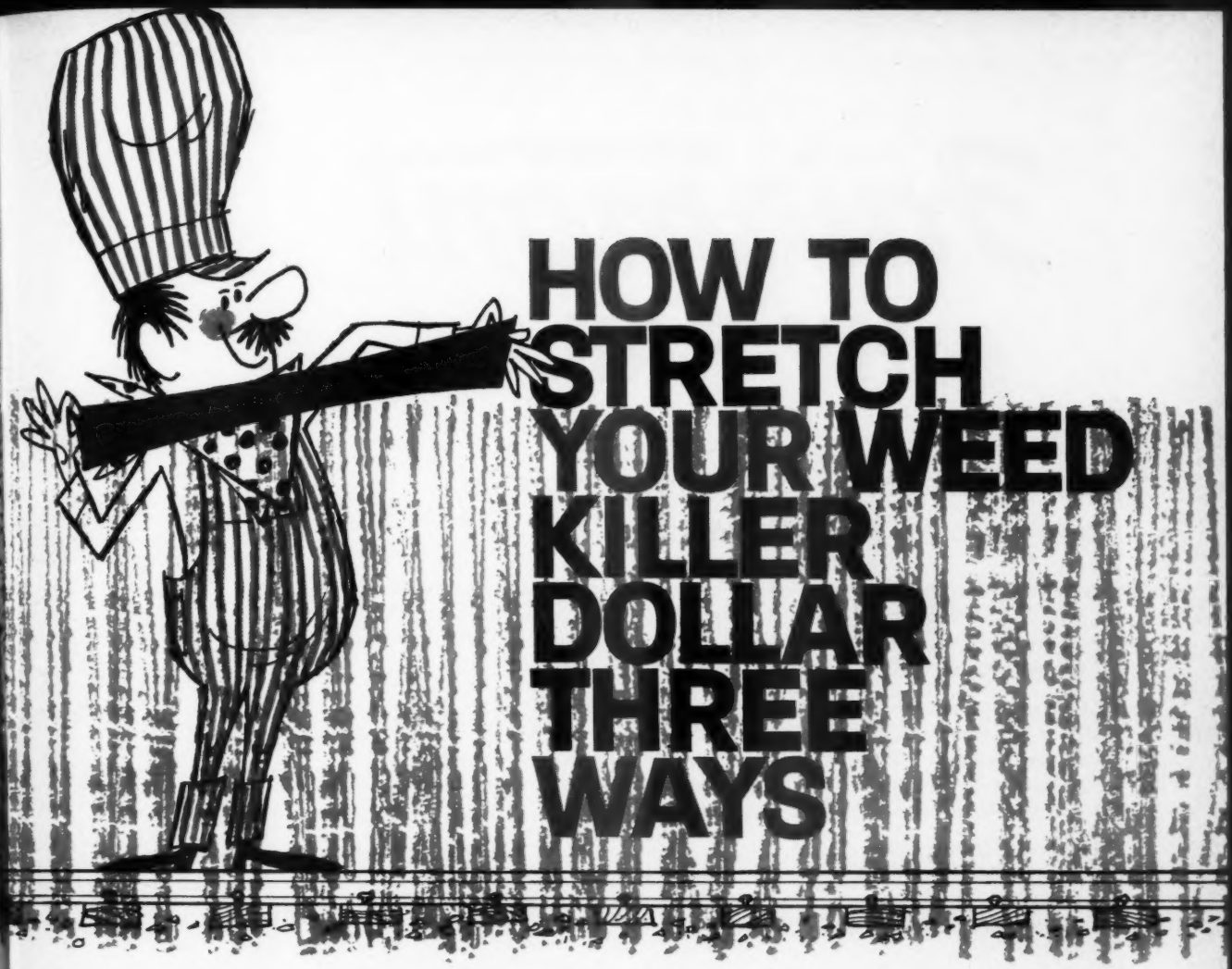
Biographical briefs

Raymond W. Pember, 41, who was recently promoted to division engineer on the Louisville & Nashville at Mobile, Ala. (*RT&S*, Sept., p. 10), was born at Louisville, Ky., and received his higher education from the University of Kentucky. He entered the service of the L&N in 1941 as a junior engineer. From 1943 to 1946 he served with the U. S. Navy. Mr. Pember was appointed instrumentman-draftsman in 1946 and assistant engineer the following year. He was advanced to assistant division engineer in 1952, the position he held at the time of his recent promotion.

Joseph F. Hoss, Jr., 32, who was recently promoted to supervisor structures on the Texas & New Orleans (Southern Pacific Lines in Texas & Louisiana) at Houston, Tex. (*RT&S*, Sept., p. 10), was born at Portland, Ore., and graduated from Yale University in 1950 with a Bachelor of Engineering degree and in 1951 with a Master of Structural Engineering degree. He entered the service of the Southern Pacific in 1954 as an associate structural designer at San Francisco, Calif. The following year he was appointed general foreman bridges and buildings at Portland. Mr. Hoss was promoted to engineer of structural design at San Francisco in 1957, the position he held at the time of his recent promotion.

Doyle A. Chambers, 37, who was recently promoted to division engineer on the Southern at Selma, Ala. (*RT&S*, Oct., p. 10), was born in Franklin County, Va. He entered the service of the Southern in

(*Continued on page 56*)



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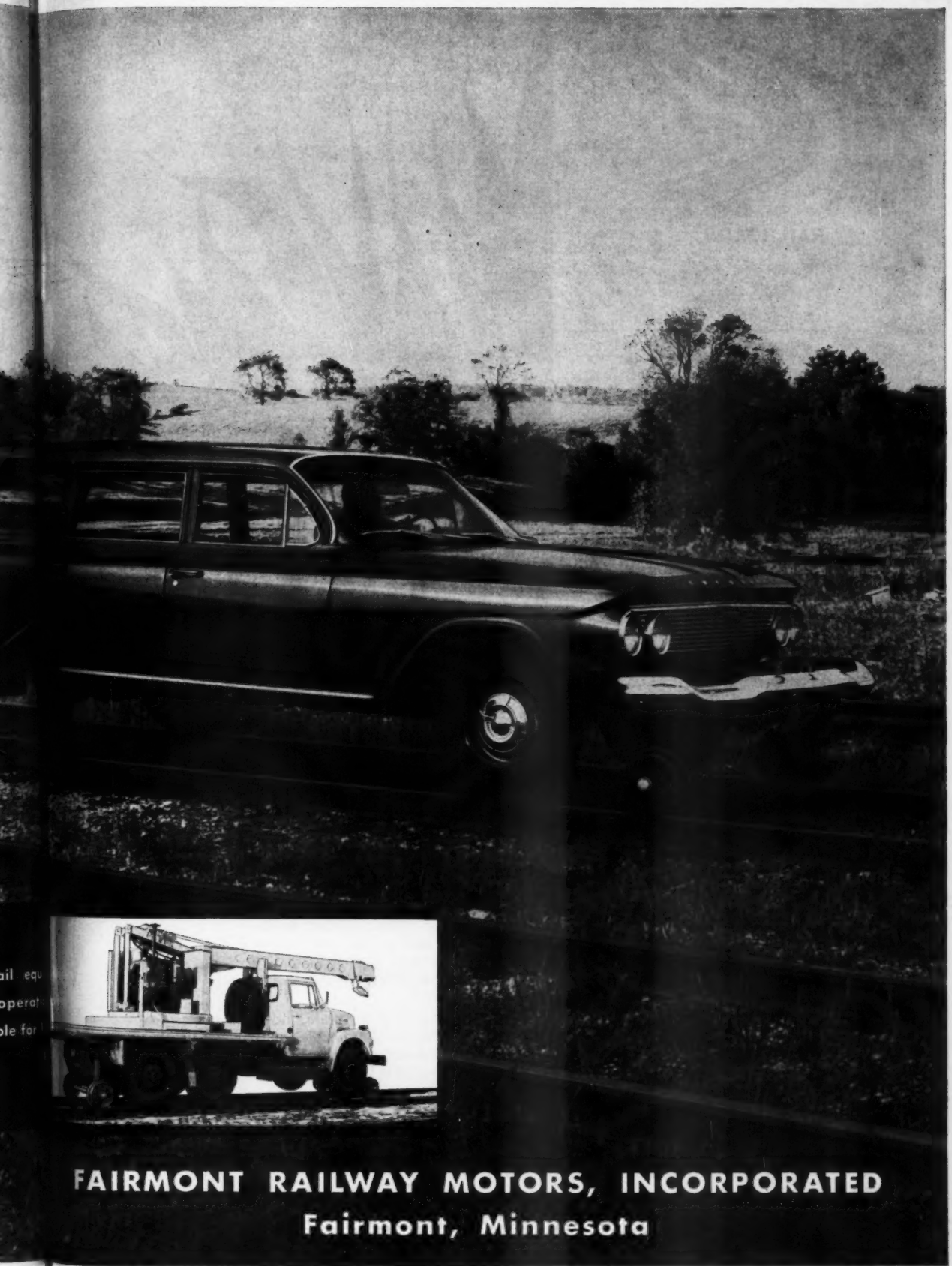

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NEWS NOTES

. . . a resumé of current events throughout the railroad world

More presidential attention to regulatory agencies, including the ICC, was recommended in a report James M. Landis submitted to President John F. Kennedy. A few days after his election, Kennedy appointed Mr. Landis to make a study "with the view to maximizing the effective dispatch" of the business of regulatory agencies. The Landis recommendations propose a reorganization plan for the ICC and call for the creation of an Office for the Development and Co-ordination of Transportation Policy within the Executive Office of the President.

Shortly after submission of the Landis recommendations, a report proposing a major overhaul of transportation legislation, regulations and policy was submitted to the Senate Interstate Commerce Committee by a study group under the leadership of General John P. Doyle. Among numerous recommendations made in the report, which came after two years of study, two important changes were proposed. One calls for a Federal Transportation Commission to take over the economic regulation of all modes of transport. The other proposed a Department of Transportation to take over and supervise all other federal activities in the transport field.

The Railway Labor Executives Association has announced it will oppose all further mergers in the railroad industry. The growing trend to railroad mergers, the RLEA said, "would have numerous adverse effects upon the industry itself, hundreds of communities throughout the nation, and the national economy as a whole." Current mergers, pending or suggested, will eliminate 50,000 jobs if approved by the ICC, according to the RLEA.

The Presidential Commission that was created to study the work-rules dispute between the railroads and the operating brotherhoods was expected to begin its deliberations around February 1. Former Secretary of Labor James P. Mitchell was appointed by Ex-President Eisenhower to the chairmanship of the 15-member commission. Mr. Mitchell also will serve as one of the commission's five "public" members.

Revised accident-reporting rules of the ICC will apply to all accidents occurring on or after January 1. Two basic changes are involved. One is a broadened scope rule requiring the reporting of all accidents occurring in conjunction with all usual activities of a railroad company. The previous scope rule undertook to confine reportable employee casualties to those relating to operation of the railroad. The other change makes an accident reportable if it disables an employee for 24 hours. This was 72 hours in the previous rule.

Profits of highway truckers declined relatively more in 1960 than those of the railroads. Estimated net income of $450 million for the railroads was 21.6 per cent below 1959. On the other hand the American Trucking Associations expects that 1960 net of the truckers before taxes will be down 40 per cent from 1959, even more after taxes.

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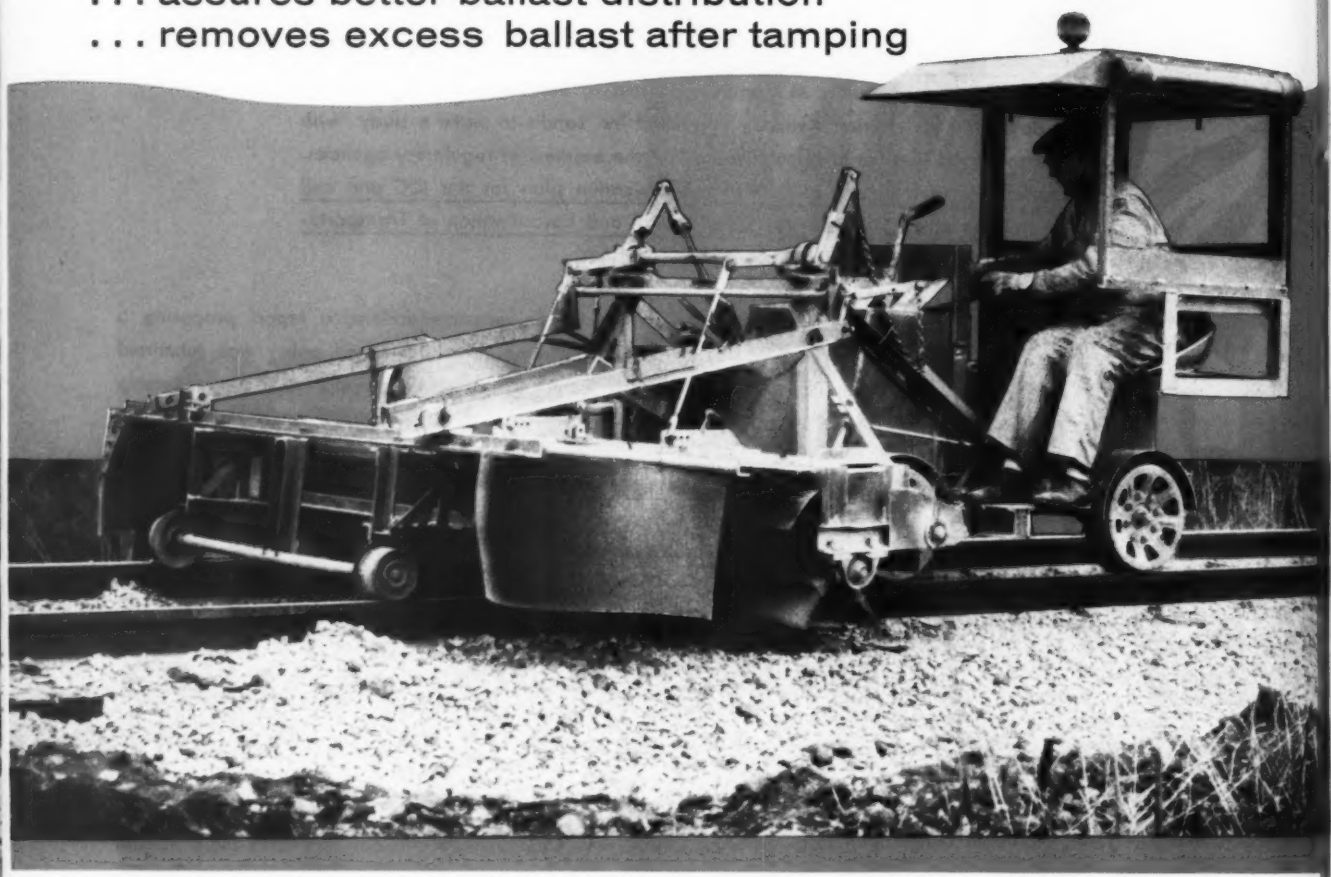

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FEATURES

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M/W efficiency— Can it be measured?

Many maintenance officers are fond of making comparisons between the performance of their departments and those on other roads. Those who indulge in this pastime can usually cite data intended to prove that practices on their lines are superior to those on other roads.

The fact is, however, there is no reliable and generally acceptable method of making a direct and simple statistical comparison between the performance of M/W forces on different roads. The maintenance-of-way ratio is frequently used for this purpose but those roads with an unfavorable ratio can usually summon a host of arguments to support the view that this ratio is not a reliable criterion of performance. In fairness it must be admitted that there are valid reasons for rejecting the M/W ratio as an accurate yardstick of performance. Its usefulness is limited to situations where highly similar conditions of traffic and tonnage prevail.

Except for the M/W ratio this magazine knows of no simple method of evaluating the over-all effectiveness of a road's M/W operations. Yardsticks in use for measuring performance on individual types of work are not much better. The use of unit costs seems to be the obvious answer but, as has been pointed out here on several occasions, methods of computing such costs vary so widely that there is little faith in them as a means of comparison. It would seem that output per man-hour would be an acceptable unit of measurement, but for some reason such units are not widely used.

Even in the absence of acceptable means of comparison the spirit of competition that has come into existence between M/W departments has had beneficial results. There was a time, early in the days of mechanization, when wide variations existed in the progress made on different roads. These differences have now been largely ironed out, thanks partly to the ingrained American habit of trying to out-perform the other fellow.

Even so, it is regrettable that more accurate criteria of performance are not available. Under the present scheme of things it is conceivable the M/W officers of a particular road may be convinced they are ahead in the drive toward greater efficiency whereas actually they may be lagging behind. In other words, the availability of a reliable means of comparison would stimulate progress by revealing those roads that are lagging.

The trouble is there is no generally applicable yardstick of over-all performance available, and no prospect that one will be developed. How then can a railroad know how it stands relative to others in its efforts to develop more efficient methods? Actually, the absence of a means of exact determination need not be a major stumbling block. From observation and objective analysis of available data a railroad can get a pretty good idea of how it's doing.

There's only one requisite — an open mind. The objective must be to determine the true state of affairs rather than to prove that the methods and practices in use on the road making the study are superior.

Making decisions

Gradually, but no less surely, an observable change is taking place in railroad supervision. Top officers are making more of the decisions. Putting it another way: Local men are making fewer decisions.

Let's look back a few years. When a roadmaster wanted to raise track or make a light surface to improve a portion of his track, he asked for authority to employ the necessary men, acquired what machines he could, organized the gang and put it to work. The foreman did the job in accordance with his training and made adjustments in assigning men from one task to another to keep the various operations in balance. The roadmaster made sure the work was being done properly.

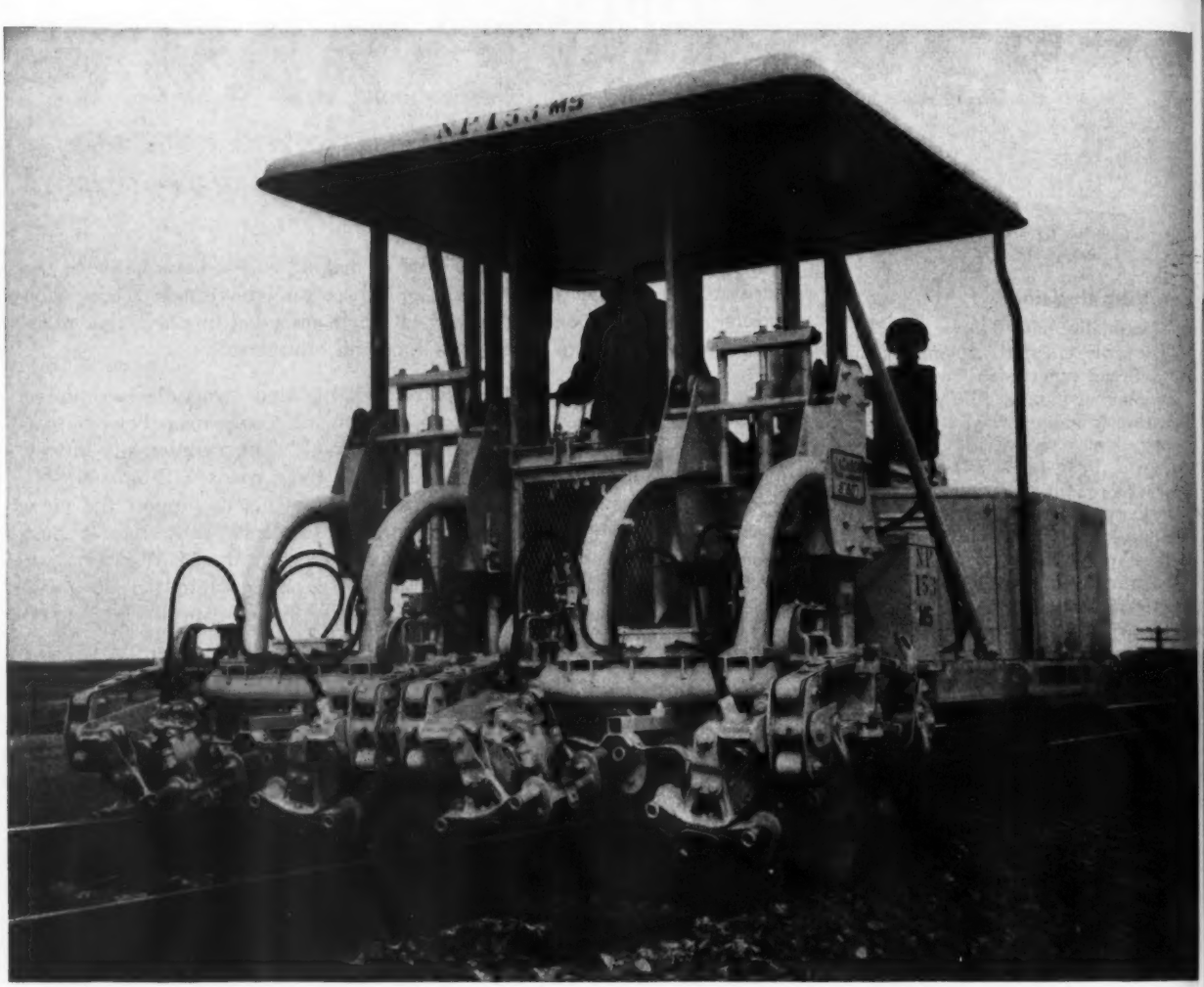
That's how decisions were formerly made. Here's how they're handled now:

The track supervisor or roadmaster is furnished certain machines and authority for so many men. He is also handed an organization statement which tells him how to deploy the men and the machines. He doesn't have to figure out how many men or machines he needs. It is all there on the statement. In addition, the statement tells him that this outfit should complete so many feet of track per hour of on-track time.

Standard organizations for major operations have become a necessity. The costs of equipment and labor make them too valuable to use except at optimum performance. For this reason, methods and process engineers must make many decisions formerly made by the local supervisors.

Nevertheless, it seems in order to point out that the practical knowhow possessed by field supervisory officers is an asset of great value to the railroads. The need for protecting and using that asset should not be overlooked.

AT THE A.R.E.A. EXHIBIT



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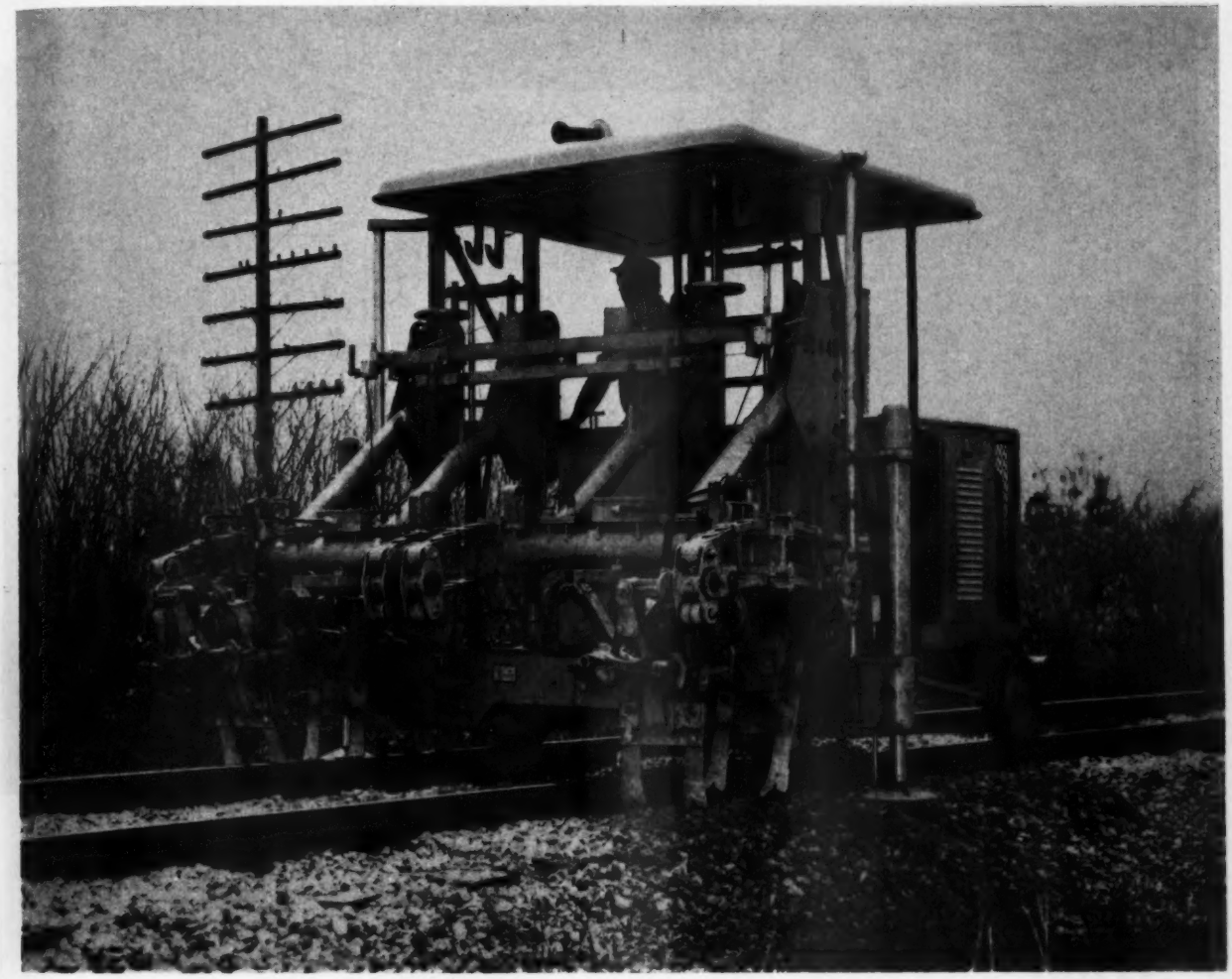

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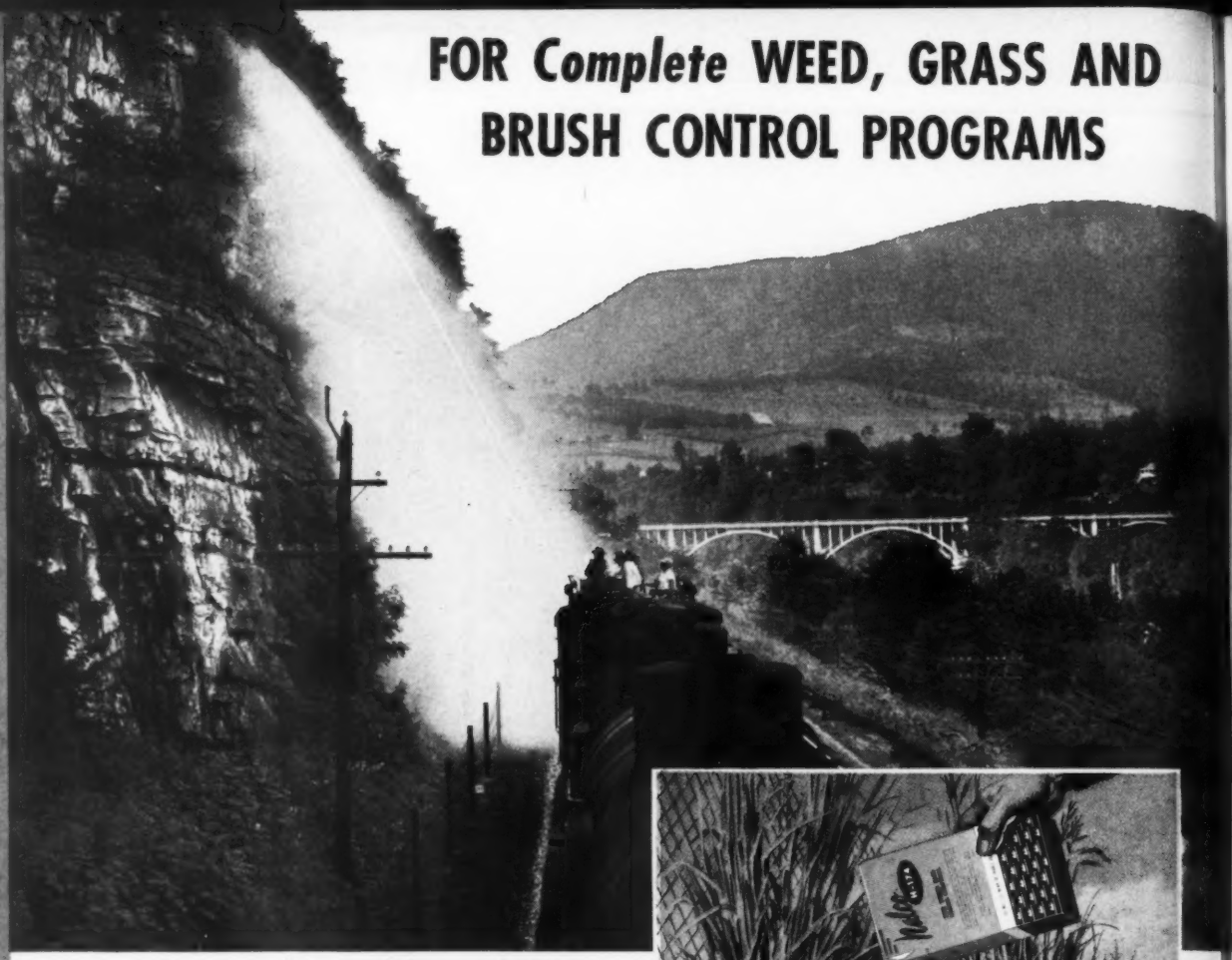

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Economy

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With Armco MULTI-PLATE, you eliminate painting, reflooring, the danger of fire damage, and other costly forms of maintenance. You can remedy many kinds of drainage problems with the wide choice of MULTI-PLATE sizes and designs. Write us today for more information about these versatile, rugged corrugated metal structures. Armco Drainage & Metal Products, Inc., 5131 Curtis Street, Middletown, Ohio.

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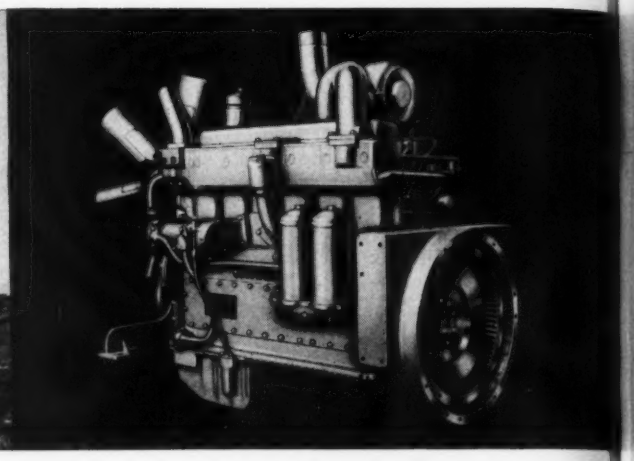
NEW CAT NO. 14 SERIES C MOTOR GRADER

Compact engine plus many other refinements assure top performance, easier servicing, long life



Important changes make up the new Series C No. 14 Motor Grader—big improvements throughout to give you better performance, long life and servicing ease:

NEW COMPACT 150 HP ENGINE The short, rigid block and stress-relieved crankshaft give greater strength and shock resistance. New cylinder head design resists distortion yet has superior cooling characteristics. Large water pump with cast-iron impeller, ceramic seal face, and carbon type seal combined with a 20 per cent increase in radiator capacity improves cooling, lengthens life.

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Plus all the features that made the No. 14B the most versatile motor grader in the "big machine" field . . .

EXCLUSIVE OIL CLUTCH —provides up to 2000 hours of service without adjustment, equal to about a year of "adjustment-free" operation.

DRY-TYPE AIR CLEANER —removes 99.8 per cent of all dirt from intake air. Can be serviced in five minutes.

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FULL VISIBILITY —operator has unobstructed view of job even while seated.

Now, all Cat Motor Graders feature the compact engine. Like the new No. 14C, the 85 HP No. 112E, the 100 HP No. 112F, and the 115 HP No. 12E are all designed to give you the highest production at the lowest possible cost. Your Caterpillar Dealer can give you the facts and figures. He can prove it both on paper and on your job. Call him today.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

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THE NEW NO. 14C MOTOR GRADER— MADE FOR THE BIG JOBS

Railway TRACK and STRUCTURES

FEBRUARY 1961
Vol. 57, No. 2

RING COMPRESSION theory is demonstrated below by Howard L. White, chief sales engineer of AD&MP. Coffee can with ends removed is easily flattened between thumb and forefinger. Behavior of conduit in compacted fill is simulated by enclosing the can in "fill" consisting of wood blocks. Demonstration shows that the can, supported uniformly around circumference, can withstand puncturing with nail or weight of man without failure.

EXAMPLE of ring compression design is afforded by this twin vehicular underpass in railroad embankment at Parrish, Ala. These are of 7-gauge Multi-Plate construction and each has a vertical diameter of 18½ ft and a horizontal span of 16 ft 8 in. Length is 168 ft, and fill is 25 ft high above the structures. Careful backfilling eliminated need for strutting during construction.

Research pays off . . .

Points way to larger metal culverts

An Armco research project has resulted in development of a new method of designing corrugated metal culverts. Known as the "ring compression" method the new concept involves the use of a simple formula for computing the load transmitted to the pipe wall. As a result, says the company, the way has been opened to much larger and lighter structures.

● Corrugated metal-pipe structures may now be built considerably larger and lighter than ever before, according to an announcement by Armco Drainage & Metal Products, Inc., a subsidiary of Armco Steel Corporation.

This has been made possible, says the announcement, by a research project which led to the development of a method of design and construction which "offers for the first time a simple, mathematical method of analyzing the behavior of a corrugated metal conduit enclosed in compacted fill." In addition to allowing such structures to be built larger and lighter the new concept of design, says the company, permits them to be covered with embankments much higher than previously thought possible.

The new development is based on a method of design which analyzes the corrugated metal structure encased in compacted backfill as a thin ring in compression, according to Howard L. White, chief sales engineer of AD&MP. Previously, the complex calculations involved in designing corrugated structures had led to the use of gauge tables for this purpose, which were derived from observations of such structures in service.

The ring compression method of analysis now offers, it is said, a simple formula for computing the load transmitted to the pipe wall. From this figure the proper gauge of steel for the structure is determined. Hence, it is said, engineers are no longer limited by handbook tables, and are able to make all necessary calculations with complete reliability.

A corrugated metal pipe installed

HOW FORMULA WORKS ➧

Metal culverts cont'd

in well-compacted backfill acts, according to Mr. White, as a thin ring in compression with uniformly distributed forces acting along the circumference. The first step in the method is to determine the intensity of the external pressure acting on the ring. This is calculated by multiplying the height of the fill above the pipe by the density of the material and adding the live load. The resulting figure is multiplied by the radius of the pipe to obtain the compressive force acting on the ring. This figure is then multiplied by a factor of safety to obtain the strength required in the ring. Reference to manufacturers' strength charts will then give the gauge and seam construction required for the installation.

Other research findings

As part of the research work carried out in developing the new methods more than thirty test structures were designed and constructed. These ranged in diameter from 16 ft to 24 ft, and had steel plate walls as thin as ⅛ in.

In addition to producing the ring compression method of design the study:

(1) Showed that pipe-arches can withstand loads equal to those of round structures.

(2) Pointed up the importance of proper backfilling.

(3) Resulted in a means of closely estimating the reaction pressures of soils, thus producing information essential in the selection of proper backfill material.

(4) Provided data on reaction pressures that permit reliable design of arch footings.

(5) Showed that vertical or horizontal strutting can be eliminated during construction of corrugated metal pipes by close control of backfilling.

With reference to backfilling, the study, according to the company, indicated a need for selecting drainable material free of large rocks, lumps, or frozen material, and placing and compacting it in 6-in lifts under haunches and close to the pipe. Remaining material near the pipe should be thoroughly compacted with vibrating or mechanical equipment, it was stated.

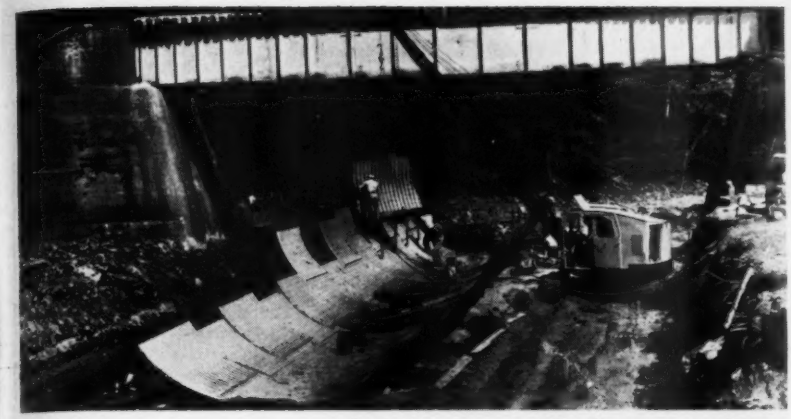
CULVERT on L&N line change, with a height of 21 ft and a horizontal span of 19 ft, is said to be the largest under main-line track in the United States.

Culvert 21 ft high was

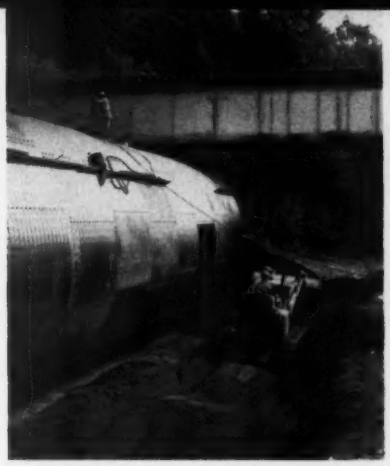
COMPACTION of backfill near pipe was done by mechanical devices.

● A huge Armco Multi-Plate culvert recently installed at Independence, Ky., 12 miles south of Cincinnati, Ohio, is an example of the application of the ring compression method of designing such structures. It is part of an 1,800-ft long bypass line on the Louisville & Nashville that eliminates an old masonry-lined tunnel and two bridges.

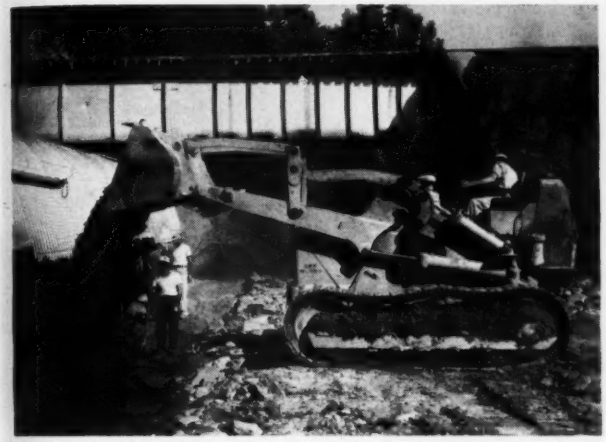
Said to be the largest metal structure under any main-line railroad in the United States, the culvert on the L&N line is elliptical in cross section, with a vertical rise of 21 ft and a horizontal span of 19 ft. It is covered by 14 ft of fill and is 100 ft long. To obtain this length 13 one-gauge rings were used, 11 rings



PROCEDURE was to complete one end of the structure while three rows of bottom plates were being laid the full 100 ft. Scaffold was used to erect remaining sections.



OPERATION of Traxcavator over backfill helped get desired compaction.



TRAXCAVATOR places backfill material around the huge culvert. Material had been dumped from cars on old bridge.

BULLDOZER spreads fill over new culvert. Heavy hauling equipment operated over pipe with only about 2 ft of cover.

designed by ring compression method

8 ft long and two rings 6 ft long.

Here's the situation that produced the need for the large waterway opening provided by the new culvert:

Because L&N Tunnel No. 8 was in need of extensive repairs the road decided to build the new line around it. Both the old and new alinements are crossed by Banklick creek at two locations. Bridges 38 and 39 carried the old line over the stream at these points.

To carry the normal flow under the new line at the location of Bridge 38 a 48-in culvert was installed. Any high-water flow will be carried by a channel which parallels the new roadbed.

However, an entirely different situation prevails at the location of Bridge 39 which is downstream from Bridge 38. The difference is created by the fact that a tributary joins the stream between the two bridges. Since the flow in the two streams sometimes reaches large proportions, a bridge or a larger diameter culvert was necessary to carry it under the new line. After considerable study of alternative designs the installation of a large culvert was approved on the basis that it would result in substantial savings in time and money.

Design of the culvert by the ring compression method was based on a dead load obtained by multiplying the height of the cover, 14 ft, by the unit weight of the material, considered to be 120 lb per cubic foot. This gave 1,680 lb per square foot. Live load, based on Cooper's E-72 loading, was figured at 750 lb per square foot. Thus the combined dead load and live load came to 2,430 lb per square foot.

According to the newly developed design formula the ring compression (C) is obtained by multiplying the unit load or pressure (P) by the radius of the structure, in this case 19/2 or 9.5 ft. Then

$C = 2{,}430 \times 9.5$, or 23,085 lb per foot.

This is the compressive force acting on 1 ft of the steel shell. For

L&N culvert cont'd

one-gauge steel plate under 14 ft of cover, experimental data reveal an ultimate strength of 144,000 lb per foot. Thus the factor of safety for the L&N structure, assuming the use of one-gauge steel plate, is more than six.

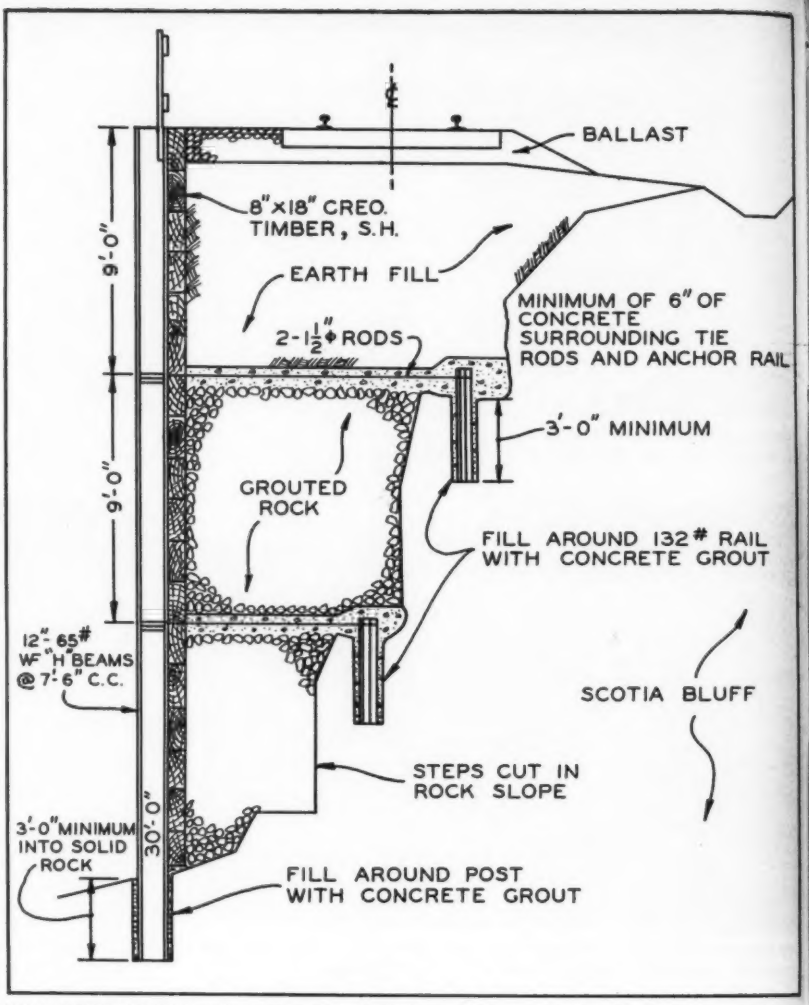
In constructing the giant culvert the first step, after the line and grade had been established, was to complete one end of the structure while three rows of bottom plates were being laid the full 100 ft. The contractor, the R. C. Burr Company, Walton, Ky., then built a simple scaffold inside the end ring to allow men to work at the top. As each ring was completed the scaffold was moved forward.

Closely supervised backfilling eliminated the need for strutting. Repeated measurements were taken at various stages of backfilling to make certain the compaction of the fill was adequate and proper. Approximately 1,600 yards of bank-run gravel were delivered in railroad cars and dumped through the openings of the bridge to be replaced by the culvert. A Caterpillar 955 Traxcavator placed the gravel around the structure.

In compacting the material pneumatic hand tampers were used close to the pipe, and an R-100 Wacker Rammer with a 10-in pad compacted the fill for a distance of several feet from the edge of the pipe. Additional compaction was obtained with crawler tractors.

Excavation for the line change amounted to approximately 160,000 cu yd of shale, all of which had to be blasted. Hauling equipment consisted of tractor-drawn pans. This equipment, which furnished adequate compaction of the shale, operated over the pipe with only about 2 ft of cover. Despite these heavy live loads over a minimum of cover, no permanent deflection is said to have resulted. Attention is called to this fact as a visible demonstration of the benefits to be derived from proper compaction.

It is reported that the installation of this large diameter culvert has generated a substantial amount of interest, with the result that engineers from many agencies in a number of states have visited the construction site to view the techniques employed during the installation work.



NEW CONSTRUCTION will protect the track from high waters in the Eel river and will also prevent it from being damaged by slides and falling rocks.

Strikes back at slides,

● Eel river and Scotia bluff are two names that have spelled trouble to the Northwestern Pacific for many years.

With the material of the bluff bearing down on the track from above, and the river tearing at the track structure from below, the railroad has been caught in a squeeze play that has cost it dearly in the form of money and traffic delays.

The railroad has now struck back. It has undertaken a series of corrective measures that includes a type of construction in which the roadbed becomes practically an integral part of the Sandstone bluff.

Here's the background:

Approximately 27 miles south of Eureka, Calif., the NWP main line is located for almost two miles on the banks of the Eel river on Scotia bluff. This is the name given to a sandstone formation that rises almost vertically from the river to a great height.

For a distance of 1.13 miles along the sheerest part of the bluff the railroad was constructed on a series of side-hill trestles. These consisted of frame bents in which the posts on the river side were as much as 40 ft in length. The total length of the trestles came to 3,480 ft.

POWER AUGER operated from existing trestle when boring holes for H-beams. Some of the posts on the river side were as much as 40 ft in length.

ROCK COBBLES were placed in 6-in layers behind timbers and grouted.

floods with special wall

The trestles were subject to damage from two sources—slides and falling rocks on the one hand and high water on the other. The greatest trouble was experienced when the slides and high water occurred simultaneously. At such times repair of the damaged trestles had to be held up until the water went down. This meant delays in restoring the track to service.

Several means have been used to deal with the problem. In 1958, one trestle 926 ft long was eliminated by cutting back into the sheer cliffs and relocating the railroad on the sandstone.

In 1959, two trestles, one 375 ft long and one 328 ft long, were eliminated by building a fill out into the river and covering the river side of the embankment with large riprap. This fill made possible relocation of the railroad away from the bluff, thus minimizing the damage from slides and falling rocks. This program was continued in 1960 during which 143 ft of additional trestle were replaced by fill.

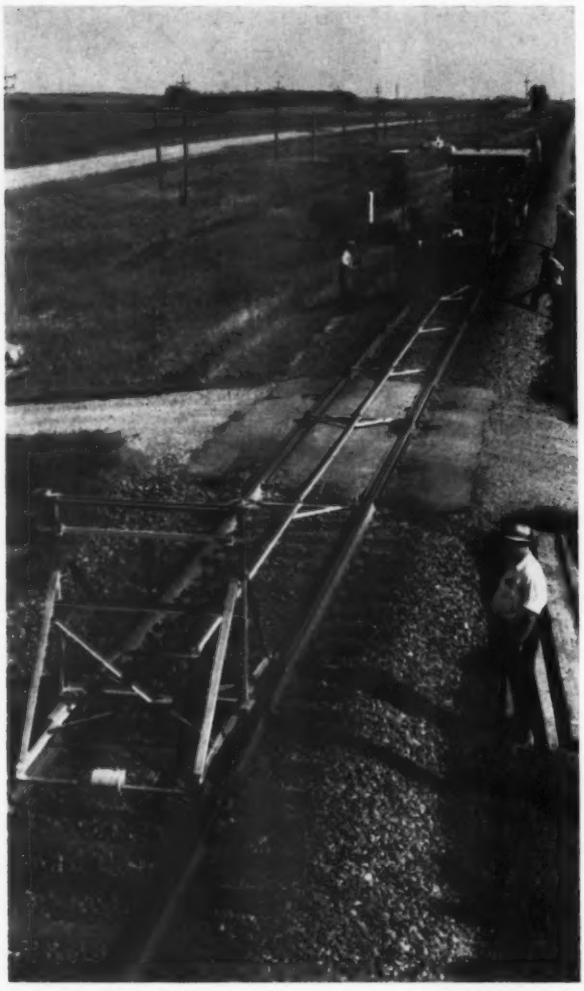
Two trestles, one 360 ft long and one 90 ft long, offered tremendous problems due to the fact that the height of the trestles above the bottom of the river was such as to preclude economical and satisfactory fill. The elimination of these trestles was made possible by a special type of retaining wall anchored to the sandstone. Details are shown by the drawing. Construction was carried out in the following manner.

A row of 12-in, 65-lb H-beams was sunk in the sandstone on 7-ft 6-in centers to a minimum depth of 3 ft, and grouted in place. The holes for planting these piles were made with a large power auger. Meanwhile, the natural sandstone formation was squared off under the trestle and stepped down.

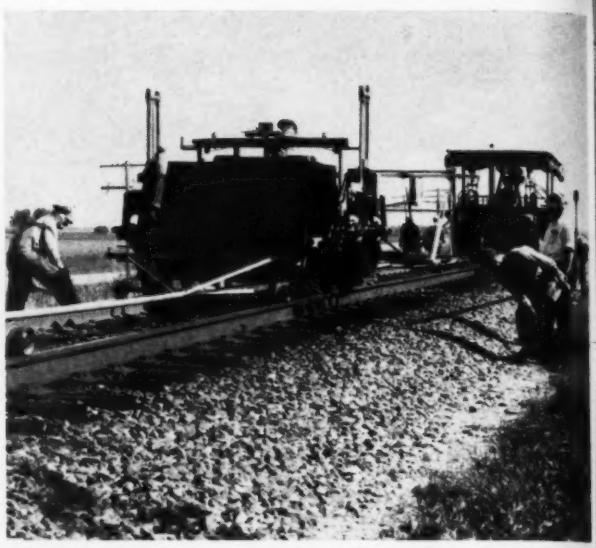
Secondhand creosoted bridge timbers 8 in by 18 in by 30 ft were put into place behind the H-beams to form a solid wall. Each H-beam was tied on two levels to sections of 132-lb rail set into the rock and grouted in place. Each tie consists of two 1½-in round rods. The top tie is 9 ft below the base of rail and the top of the H-beam, and the second is 9 ft below the first.

Granite rock cobbles averaging about 6 in. in diameter were then placed in 6 to 8-in layers and grouted in place up to the top tie rod. However, a minimum of 6 in of concrete was placed around each pair of tie rods. The last 9 ft of the fill was made with good-quality earth. Squaring the sandstone and placing the grouted cobbles made this in effect a gravity wall up to the first tie rod and minimized the stress against the H-beam columns.

The Northwestern Pacific feels that this type of construction will reduce the possibility of damage from high waters in the Eel river. Furthermore, in the event of a slide or a portion of the cliff falling out, it is felt that the debris can be cleaned from the track by earth-moving equipment in a short time.



LEADING UNIT of the smoothing gang is the Nordberg Trak-Surfacer used in conjunction with Tamper Inc.'s tamping jack.



TAMPING JACK must be a fast worker to stay ahead of the production tamper. This one is making an average lift of 1 in.

Great Northern aims at faster smoothing

● For its small mechanized smoothing gangs, the Great Northern is aiming at a half mile of track surfaced per gang per day. During the working season, it has nine such gangs, five working on its Lines East and four on Lines West. Production figures for these gangs during 1960 were quite close to the set goal, averaging from 2,200 to 2,700 ft of track surfaced per gang, depending upon traffic conditions. One gang, however, was equipped with some new machines and averaged from 2,500 to 2,700 ft per day with an average of 12 train interruptions.

This gang was comprised of a foreman, 4 machine operators, 5 laborers and a flagman, or a total of 10 men in addition to the foreman. It was assigned a Tamper, Inc., Model TJ-2 tamping jack, working in combination with a Nordberg Trak-Surfacer, an Electromatic tamper, a Hydrillbolter, and a Trakliner—Line Indicator combination. One day a week, a Kershaw Ballast Regulator with a track broom was operated behind the gang to dress up the ballast. The flagman was furnished with a pick-up truck to facilitate his work, particularly the setting out and picking up of torpedos each side of the gang.

The men and equipment in this gang were disposed as follows:

One operator and 2 laborers with the tamping jack. The laborers nipped ties, fed ballast to the tamping tools and handled the buggies of the Trak-Surfacer.

One operator and 2 laborers with the Electromatic tie tamper. The laborers nipped ties and shoveled ballast to the tamping tools.

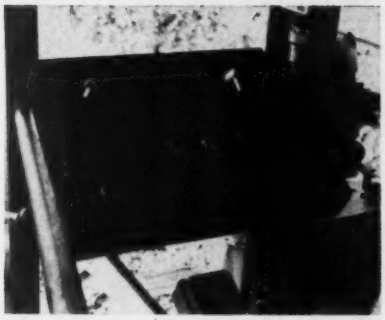
One operator with the Hydrillbolter. This machine was used to loosen and tighten joint bolts as necessary to adjust for expansion.

One operator and 1 laborer with the Trakliner—Line Indicator. The laborer leveled the ballast in the cribs and assisted in handling the buggies of the Line Indicator.

When seen in operation this gang was working on track which had not been disturbed for about eight years and was giving the track an out-of-face skin lift. This was considered preferable to spotting up the low spots. The average lift was 1 in or slightly less and the operator of the tamping jack was raising the low spots $\frac{1}{16}$ in high to compensate for additional settlement under traffic.

Every tie was tamped by the Electromatic tamper, which worked

ELECTROMATIC TAMPER works at rate of 1 min 50 sec in tamping a rail length. An indexing finger gives automatic operation but throwing a switch returns it to manual control.



BUTTONS on control panel provide fingertip control for operating crossheads independently or simultaneously.

TRAKLINER with Line Indicator completes the equipment consist to provide well-balanced gang performance.

Out-of-face surfacing work on the Great Northern these days is primarily a smoothing operation involving a nominal adjustment lift. The reason is that the road has practically completed a systemwide reballasting program involving the application of crushed-rock ballast. This article tells how it is seeking to get increased production from the gangs engaged in smoothing work.

at a constant rate of 1 min 50 sec in tamping the 24 ties per rail length. The machine has an electric indexing finger which enables it to work automatically, except when the operator presses a button for manual control. In tamping ties this machine operates on the squeeze-vibratory principle, a feature which W. J. Cruse, engineer maintenance of way of the GN, says is well-suited to the type of ballast used on his road. He also notes that the unit has a ball-bearing turntable "which makes it easy to take the machine off the track, and also to reverse its direction when necessary." Total daily production of the gang was affected by the fact that it was working under traffic in single-track territory. To get maximum production the equipment was worked two shifts from about June 1 to the end of August. During this period the two shifts could be worked without artificial lighting.

Very little additional ballast was required for the smoothing work. The reason for this goes back to 1947 when the GN undertook a program to replace all the existing ballast on its main tracks with crushed rock. Today, about 95 per cent of the main track has been reballasted, as well as some portions of the secondary main tracks. As a result, the main-track ballast sections are standard with full cribs and provide sufficient rock for the light raises now being made. Because the clean ballast does not freeze readily the smoothing gangs can be worked into the fall.

When the ties are renewed in conjunction with the smoothing work, the road does this with a separate force. It is comprised of a foreman and 5 machine operators. Not wanting to disturb the track in the rock ballast any more than is necessary, the GN uses two Woolery tie saws to cut out the center portions of the old ties, a Woolery tie-end remover to eject the tie ends and a Tamper, Inc., Hydrenewer to insert the new ties. Tie renewals are carried out on a cycle basis, with cycles ranging from 5 to 10 years, and when practicable are coordinated with smoothing lift programs.

THE PANEL: Left to right — Burton J. Worley, P. A. Cosgrove, J. L. Perrier, M. S. Reid, T. C. Netherton, and Lawrence Schrader.

. . . The revolution in track

In a few short years the entire approach to track surfacing has undergone revolutionary changes on nearly every road. The nature and extent of these changes, and questions rising from them, were the subject of a panel discussion at a meeting of the Maintenance of Way Club of Chicago on December 19. Here is a partial transcript of the discussion.

Reid: So that we will all understand the terminology to be used in this discussion we will need a few definitions. When we refer to "spot surfacing" or "smoothing," we mean the raising of joints or one side of the track to level, with no out-of-fact tamping. When we speak of "skin lift" or "light out-of-face lift," we're talking about an out-of-face raise of from ¾ in to 2½ in. When we speak of "ballasting" and "heavy surfacing" we're referring to an out-of-face raise of 3 in or more.

Before starting the questioning I'd like each of the panelists to give us a brief description of the kinds of surfacing work being done on his road and the types of equipment being used. I'll call on Mr. Worley first.

Worley: On the Milwaukee we have a set of mechanized equipment consisting of a power jack tamper, a production tamper and a lining machine for each roadmaster whose territory averages about 250 main-track miles. This equipment is used to spot and line, make skin lifts and also to do out-of-face surfacing. While we have sufficient equipment for each roadmaster, it is not always worked that way. A division engineer may take the two sets of equipment and put them on one roadmaster's territory. In fact, when we're working on a double track between Chicago and Milwaukee, we usually put three sets of equipment together, spacing them out on a dead section of track 10 to 12 miles long. With this arrangement the track to be tamped or surfaced can be covered in a minimum of time thus reducing interference to trains.

Our mechanized tamping gang consists of eight laborers, three machine operators, an assistant foreman, a foreman and a general foreman. Our mechanized surfacing gang normally consists of 14 laborers and 4 machine operators. The fourth machine operator operates the broom and the regulator and if we are spacing ties with a tie spacer we have a total of five machine operators. The supervision is the same as with the tamping gang. We use live flagmen unless the track can be taken out of service, or unless the foreman has a statement in writing from the dispatcher that there will not be a train during the assigned working hours.

Our tamping and lining gangs normally cover about a mile a day and our gangs making a skin lift or doing out-of-face surfacing work cover in the neighborhood of 3,500 ft a day. With all of our mechanized gangs, we cover from 3,000 to 4,000 miles a year. We are well satisfied with our mechanized gangs and have been able to get smoother track with greatly reduced costs.

Cosgrove: Our set-up differs from that on the Milwaukee in that our machinery isn't assigned to any division or any supervisor or roadmaster's territory; it's assigned to the system as a whole. Our surfacing gang consists of a power jack, two tampers working in tandem and a lining machine. This group of machinery can usually surface about 15 miles a month. We can figure that an outfit like this will surface about 100 miles of track during our working

Members of the panel

Presiding officer:

J. L. Perrier, division engineer, C&NW (president of the club)

Moderator:

M. S. Reid, assistant chief engineer—maint., C&NW

Panelists

Burton J. Worley, engineer maintenance of way, Milwaukee Road

P. A. Cosgrove, division engineer, Illinois Central

Lawrence Schrader, district methods engineer, New York Central

T. C. Netherton, district engineer, Pennsylvania.

surfacing

season which runs from May to November.

We're a little more fortunate than most of the other railroads in that when we complete our work on the Northern Lines, which are north of the Ohio river, we can ship the machinery south where it can be used to advantage on our Southern Lines.

With some of our gangs we have a power jack equipped with a sighting device, which helps us considerably. On some of the others we use the manual blocks to raise the track. On our branch lines and secondary lines we use the Jackson Multiple Tamper, and with this outfit we don't use the power jack.

Netherton: On the main line portion of my district of the Pennsylvania, covering approximately 250 miles of double-track line and with gross tonnage of 20 million annually on each track, we use two separate "skin-lift" units which work in the same block on a track and will be separated about four miles. Each unit consists of eight men, and is equipped with a tamping jack with raising wire, a "midget" surfacing device, a mechanical tamper of the vibrating-squeeze type, a liner with wire, and a Ballast Regulator. Ties are not installed with this operation.

We also have, as a part of this operation, a separate road-crossing gang, consisting of four men and a fully equipped Speed Swing machine, to rehabilitate the approximately one and one-half road crossings per mile in my territory.

Finally, our work train gang, consisting of six men, unloads stone at the rate of about three cars to a mile for a one-inch lift. We work against the current of traffic and by so doing we find that the ties are pushed up against the rail anchors. Consequently we don't have to have anybody straightening anchors. Our men are housed in camp cars and usually move from point to point as our production units move.

Schrader: The surfacing practices on the New York Central are based on need which, in turn, is based on riding quality. In the summer season the tracks are ridden at least once a week by a track supervisor, a division officer or a district officer. At that time any inequalities which are found are handled by small maintenance gangs, or smoothers, as we call them, if they're in the vicinity. A smoother is a production tamper with jacks on it that goes out with one man, a foreman and an operator and picks up these spots.

All long stretches of choppy track are programmed for an entire surfacing job. In the winter season our tracks are ridden each day by a track supervisor or the other personnel that rides once a week in the summertime. The single spots that are found during these trips are handled practically in the same manner as in the summer months. The summer surfacing program is actually formulated from these rides in the winter, plus the fact that we go out on the ground to see what's out there.

The type of surfacing to be done is decided on the basis of these field inspections. We use three basic lifts on our railroad, all the way from nothing on the high spots to three inches and sometimes higher. We use several types of high-speed split-head tampers. Raising is done with a tamping jack used in conjunction with the wire raising device. In lining we also use the wire device. We try to program all our work so that we can have detour train movements, that is, so we can work on dead track.

We use three basic gang organizations. On our smoothing, or spotting as some people call it, we use a foreman, a tamper operator and one laborer. When making an out-of-face lift we have a foreman, a ballast-equalizer operator, a tamping jack operator, one or two tamper operators, and one liner operator. The third one varies from the latter only because the raising is done with a power jack, requiring two men to tamp the ties at the raised points.

Reid: Mr. Worley, when making a 2-in to 3-in surfacing lift, has it been the practice on your railroad to renew ties ahead of the surfacing gang, or are ties renewed as part of the surfacing operation?

Worley: Previous to mechanization, we renewed ties as part of the surfacing operation, but since we mechanized, we renew the ties ahead. If the tie renewals are light they are handled by the section forces. If they are heavy enough to justify the use of machines we put on a mechanized tie gang in advance of the surfacing. I might add that we have tried it the other way and we have found that it takes too much spotting ahead of the production tamper, and there's also too much spotting to be done by the section forces behind. I should add here that we are a gravel-ballast railroad and our situation in that respect would be a little different than a railroad that uses rock ballast.

Reid: Mr. Netherton, what is the cycle your railroad uses for out-of-face surfacing, taking into consideration the various types of ballast and the condition of the rail?

Netherton: We have a two-year cycle on my territory which has stone ballast. Perhaps it might be expanded to three if our rail condition were somewhat better. The rail on my territory averages in age about 17 years, and we have seen fit to set up a two-year cycle. For example, my territory consists of 246 miles of double track, and this year we raised 254 miles of track.

Reid: Mr. Schrader, why is it decided to surface a piece of track in the beginning?

Schrader: Riding quality is the biggest thing of course, plus the fact that you save rails and ties by surfacing track, particularly at the joints. Also you surface track along with your tie jobs. In addition, when you lay new rail you definitely want to surface your track.

(*Please turn the page*)

The revolution in track surfacing cont'd

". . . . My territory consists of 246 miles of double track, and this year we raised 254 miles of track with my surfacing units."—*T. C. Netherton*

"In general I believe the best practice is to surface the road crossings and turnouts in connection with the out-of-face surfacing."—*P. A. Cosgrove*

"Previous to mechanization we generally raised the track at joints and centers, but with mechanized equipment we are raising every eighth tie."—*B. J. Worley*

"Our practice at the present time is to follow up two to three weeks behind a heavy lift and spot the track, preferably with a smoothing machine."—*Lawrence Schrader*

Reid: Mr. Worley, how does productivity of surfacing with new methods compare with old methods on your railroad?

Worley: Previous to mechanization a 60-man gang, including supervision, would surface about 3,500 ft of track a day. Today, with our mechanized crew consisting of about 20 men we get the same footage. In other words, we get the same footage with about one-third of the manpower and we get a much better job with our mechanized equipment.

Reid: What is your practice, Mr. Cosgove, as far as working through crossings and turnouts while surfacing with production tampers?

Cosgrove: In general I believe the best practice is to surface the road crossings and turnouts in connection with the out-of-face surfacing. What I try to guard against is leaving more work for the supervisor than he had before we came on his territory to give him a hand. I think the best way is to have a foreman and maybe three or four men do nothing but take the crossings up and put them down behind the surfacing operation. In this way the crossings are ready for the tampers when they get to them.

We recognize the fact that this practice involves some delays to our surfacing operation through areas such as this, but considering the overall picture we feel there is more to gain by doing the work as we go than leaving it and trying to get back to it. Another consideration is that if we leave areas such as this to be taken care of by hand, we have to have another slow flag or another slow order at this location again, and we try to minimize the number of slow flags or surfacing flags that we have on our railroad.

Reid: Mr. Netherton, can you compare the quality of tamping today with that done 20 years ago on your railroad?

Netherton: Twenty years ago our surfacing was done either with forks or air tools, primarily the latter. In my humble opinion a mile of track air tamped is superior to a mile of track that is worked with our present-day machinery. However, the total production is such that we now have a uniform roadbed all over our district, whereas 20 years ago one supervisor would have far superior track. Or perhaps only part of his track would be superior to the rest. That's no longer true; our railroad is uniform throughout and considerably better overall than it was 20 years ago.

Reid: Mr. Schrader, what dictates the type of work assigned to correct the condition on a given stretch of track, that is, whether you give it a smoothing lift, or a skin lift, or high out-of-face lift?

Schrader: A determining factor is the type of equipment you have available. Secondly, you've got to consider whether the track is in good shape except for the joints and short spots, or whether there is an out-of-level or centerbound condition. The condition of the subgrade, especially the drainage, is another factor to be considered.

Reid: Mr. Worley, at what intervals are you tamping ties in the raising operations with power tamping jacks?

Worley: There are a number of factors to consider, including the weight of rail and the condition of the rail. Another is the ballast you have unloaded, and how much of it you have on the ties. Previous to mechanization we generally raised the track at joints and centers, but now we are raising every eighth tie.

Reid: Mr. Schrader, do you think it is desirable to spot behind an out-of-face lift of 3 in or more?

Schrader: Yes I do. Our practice at the present time is to follow up two to three weeks behind a heavy lift and spot the track, preferably with a smoothing machine. If we don't have such a machine available, we send out a small spotting gang consisting of two or three men with a compressor.

Reid: Another question for Mr. Worley: With the use of mechanized equipment the tendency is to go to cycle maintenance. How often do you feel it is necessary to make a 2-in to 3-in out-of-face raise, and how often is it necessary to spot track?

Worley: There are a great many factors that help to determine the surfacing cycle. These include the weight and condition of the rail, the drainage and other local conditions. If the surfacing cycle is too short the money is not wisely spent. On the other hand if the interval between surfacings is too long the result is excessive wear on the rail, the fastenings and the ties. Once the cycle is determined it should be followed.

To answer the question more specifically, on the east end of our Iowa division, which is laid with 115-lb rail and carries about 10 million gross tons of traffic a year, we surfaced the track in 1955 and again this year, giving a five-year cycle. As for spotting, I don't think you can establish a cycle for this work because it depends on the conditions you have.

Reid: In view of the improved methods and increased production, is there a tendency, Mr. Cosgrove, to surface track out of face rather than to do smoothing or spot-surfacing work?

Cosgrove: I think this question gets us into a situation that has to

(*Continued on page 35*)

IT'S HERE!

LINDE'S ALL-NEW RAIL WELDING METHOD

...biggest step forward in rail welding in 22 years!

YOUR OWN FULLY MECHANIZED ASSEMBLY PLANT FOR *Ribbonrail*® SERVICE

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A completely new, integrated Continuous Rail Welding System by LINDE that helps railroads slash rail welding costs *by more than 40%*.

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on a mechanized, production-line basis at any location you select

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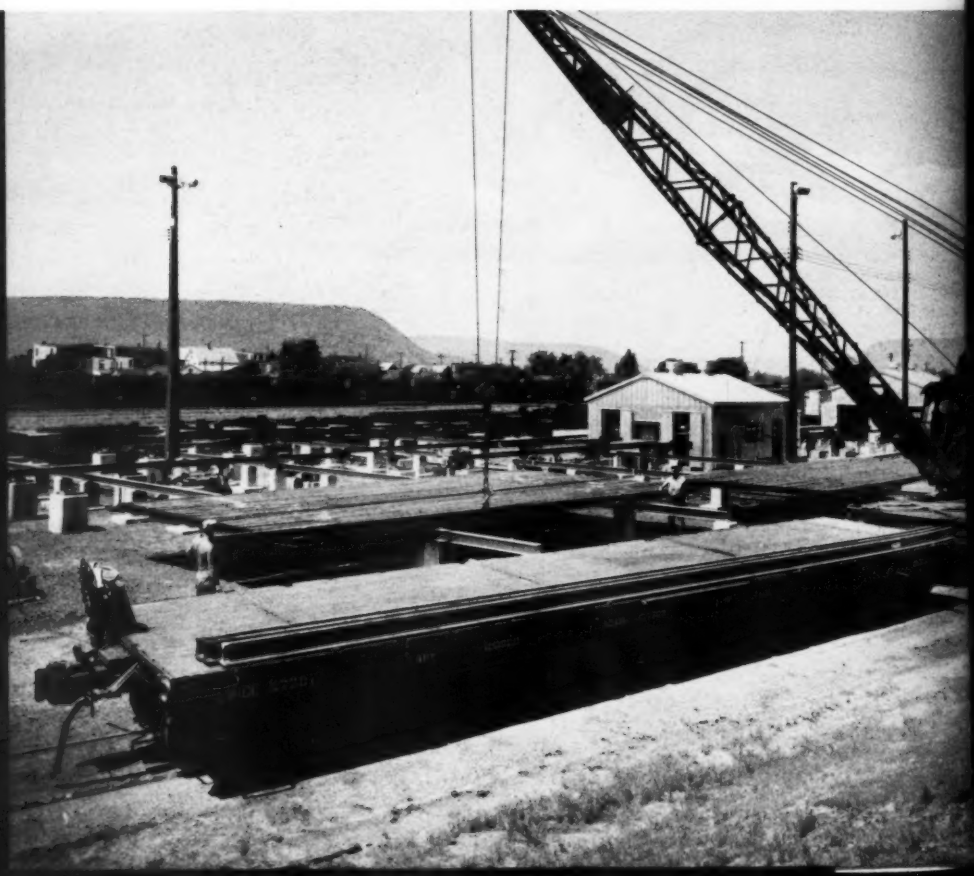
1.

New, standard 39 ft. rails are unloaded at LINDE's RIBBONRAIL Production Center. This equipment makes continuous welded rail with either new or relayer rail.



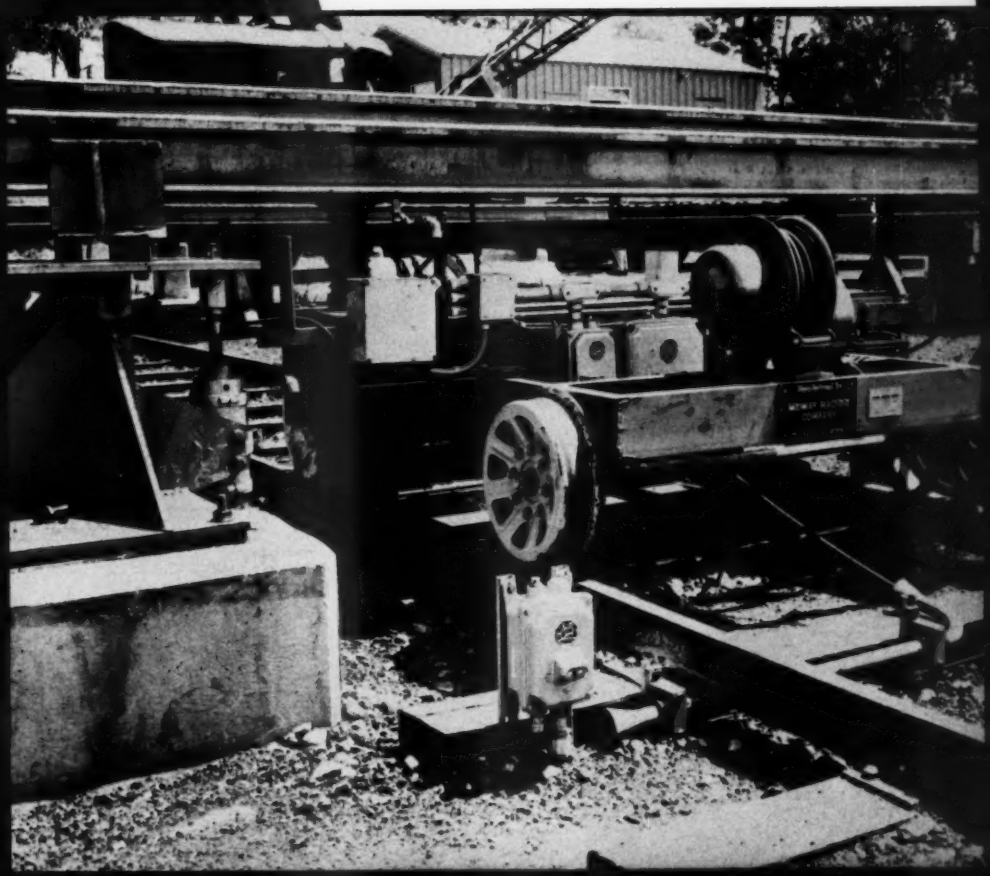
IT'S HERE!

LINDE'S ALL-NEW RAIL WELDING METHOD

...biggest step forward in rail welding in 22 years!

2.

Automatic rail handling cars bring rails from storage racks and deposit it on the production line as it is needed. The empty car then shuttles back to the rack and repeats the loading cycle. Sensing devices tell the car when new rail is needed.



TODAY

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3.

In the production line, the rail is forwarded by a power roll which advances it to an idler lift roll. This device compensates for the camber of each rail with a series of specially designed air pressure devices.

Ribbonrail® Service Welding

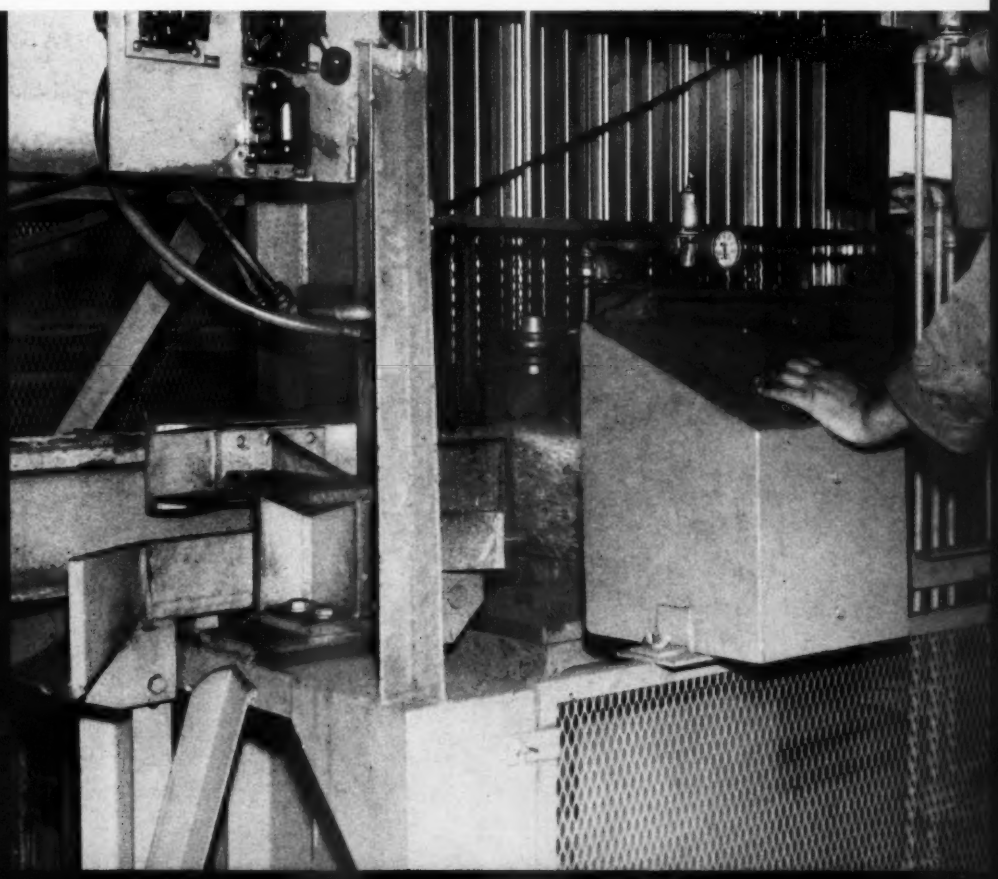
...and you may *Furnish Your Own Crew* or *Use a* LINDE Crew.

Either way, you get the finest welds available, backed by the experience and "know how" of the manufacturers of the world's finest welding equipment. "Know how" gained in more than fifty years as leader in the welding industry.

RIBBONRAIL Service provides you with consistent, high-quality welds. You get a dependable, steady supply of welded rail, delivered when you need it. These photographs illustrate the new, RIBBONRAIL Service automated production line developed by LINDE to provide railroads with the most efficient and economical method of obtaining continuous welded rail of the highest quality.

4.

The end finisher squares two rail ends simultaneously. Guides align the rail to critical tolerances, then an abrasive belt squares the trailing end of one rail and the leading end of the rail following it. The rail is advanced and the same operation is repeated on the trailing end of the rail and the front end of the next rail in line.



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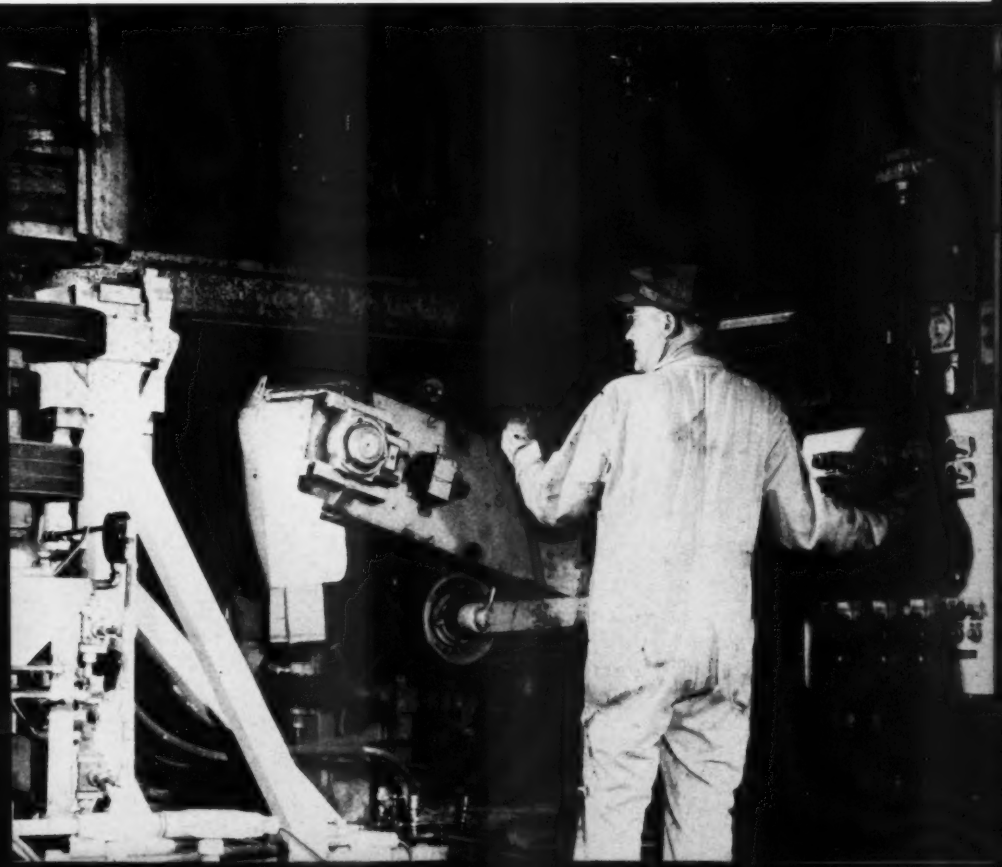
6.

Next, the continuous welded rail advances to the grinding machine. This machine removes excess upset metal from the top and sides of rail ball, the sides and bottom of the base, and the sides of the web. Continuous belt grinders remove the metal while it is still hot. Upon completion of grinding, the weld is inspected and loaded aboard a waiting rail train.

The continuous welded rail "string" is now ready for shipment to the laying point. No additional welding, grinding or other post-welding treatment is required.



Automated Production Line Continuous Rail Welding At Your Own Location with *RIBBONRAIL* Service Equipment.

Automated production line welding of rails at your own site is the most important step in rail-laying since 1938, when LINDE introduced the first oxy-acetylene pressure welding machine. Since then, LINDE'S engineers have made many improvements in equipment and techniques. Now, this new rail welding system—springing from an entirely new concept and requiring completely new machinery and handling equipment—is offered by LINDE to the nation's railroads. With this equipment you can produce continuous welded rail with fewer people, at a lower cost than ever before.

RIBBONRAIL SERVICE PRE-WELDED Continuous Rail on a Cost-Per-Weld Basis From a *LINDE* CONTRACT PLANT.

Last year, at the request of many of our railroad customers, LINDE Company established dual-line rail welding centers near leading rail rolling mills. During this past year, two of these LINDE Rail Welding Centers have gone into operation. One plant is located at Harrisburg, Pa., near the Steelton Mill of Bethlehem Steel Company, the other, at Birmingham, Ala., is adjacent to United States Steel's Tennessee Coal and Iron Division. Similar plants will soon be established in other parts of the country. These plants free railroad capital and personnel for other jobs. Rail is produced at a pre-determined cost-per-weld according to contract specifications.

PRIMARY BENEFITS OF *RIBBONRAIL* SERVICE

For more than two decades, railroads across the country have been reaping the advantages of RIBBONRAIL continuous welded rail. Some of the proven benefits of RIBBONRAIL Service include—

- **LOWER TRACK INSTALLATION COST**
- **REDUCED TRACK MAINTENANCE**
- **LONGER RAIL LIFE**
- **LESS WEAR ON ROLLING STOCK**
- **GREATER SAFETY FOR ROLLING STOCK, FREIGHT, PASSENGERS**
- **A SMOOTHER RIDE**

RIBBONRAIL SERVICE PRODUCTION-LINE WELDING Can Reduce Your Costs in Many Ways

Complete information on LINDE'S new production-line method of making continuous welded rail is available on request. For details, consult LINDE'S OXWELD Railroad Department representative in the LINDE office nearest you. Or write RIBBONRAIL Service, Linde Company, Division of Union Carbide Corporation, at either of the following locations: 270 Park Avenue, New York 17, N. Y. 230 N. Michigan Avenue, Chicago 1, Illinois. In Canada: Union Carbide Canada Limited, Linde Gases Division, 123 Eglinton Avenue, East, Toronto 12.

Oxweld Railroad Department

Linde

UNION CARBIDE

Panel discussion

(*Continued from page 28*)

be policed. We've all heard the comments by supervisors saying that they can surface a given piece of track faster than they can smooth it. What these supervisors forget is the fact that to do an out-of-face surfacing job we have to furnish them with ballast and sometimes ties, and it takes more labor to do this work. We know it can be done probably just as fast, but with a production tamper a supervisor can take a smaller gang about half the size of a surfacing gang and go out and smooth, line and level a piece of track and make it ride pretty well without adding ballast.

In my opinion we can probably stretch the cycle of surfacing by another year or two by getting in there and spot surfacing, or smoothing as we call it on our railroad, rather than surfacing out of face.

Reid: What is your daily average production for surfacing units, Mr. Netherton, and how much on-track time might this be based on?

Netherton: One of the two surfacing units on my territory averaged 4,621 ft a day during the 1960 season; the other, 4,711 ft. These units worked a five-day week throughout the season. One of them was down for repairs a total of 3 days, the other, four days. Based on the total number of days from April 1 to October 1 we averaged not quite a mile a day for each of the two tampers.

Reid: Were you spotting or making a skin lift?

Netherton: A skin lift of a maximum of 1 in. Incidentally, these units have full use of the track. Allowing one-half hour for lunch the productive time is 7½ hr, less travel time to and from the job.

Reid: Mr. Schrader how do you know when a tie is sufficiently tamped?

Schrader: By standing with the machine you can watch to see that the plate comes up to the rail. Sometimes, we dig the ballast from the ends of a tie while the machine is tamping and watch the voids fill. At other times, particularly in the afternoon or with operators we aren't familiar with, we go behind each machine and loosen the spikes and pull a tie for a visual examination.

CAR INSPECTORS use this trailer as temporary quarters at the west end of the new receiving yard. It will serve until a permanent building has been erected.

Trailers serve as temporary

YARDMASTER, trimmers and skatemen have temporary quarters in this trailer at the yard. Later both trailers will be used for housing bridge and building gangs.

quarters for yard men on B&O

● When the Baltimore & Ohio was nearing completion of its new classification and terminal yard at Cumberland, Md., the grading and track work were ready to put into service before some of the buildings had been erected. To take advantage of the savings inherent in operating the new yard, the road decided to use highway trailers as temporary quarters for some of the yard personnel until permanent structures could be built.

Three trailers were purchased from the Atlantic Trailer Corporation as temporary headquarters for carmen, repairmen, trimmer crews, skatemen, inspectors and a yardmaster. They were of the type that is designed for use as field offices by contractors and engineering crews. They are 35 ft long and 8 ft wide.

The running gear was removed from each unit, then the trailer was set on treated timber blocking. Connections were made to both sewer and water supply lines. Bottled propane gas is used for heating.

Two more trailers were acquired for similar use at other points. One was obtained for use as temporary headquarters at Cairo, W. Va., for engineering personnel, while making studies for increasing tunnel clearances. The other is being used at Chester, Pa., as headquarters for a track gang.

The road reports the trailers have obvious advantages as offices on construction projects and serve well as temporary headquarters for personnel until permanent structures are erected. When the trailers are no longer required for their current uses, the running gear will be restored and the units will be assigned to house bridge and building forces on construction projects.

ICE-BREAKER CAR devised by the Clinchfield for snapping off icicles from the roofs of tunnels and ice accumulations at the portals to eliminate the possibility of damage to automobiles on tri-level rack cars.

Car-mounted frame clears ice from tunnels

● Paint dropped by vandals from overhead bridges or bullets shot through the windows of automobiles being hauled by railroads are not the only ways that new cars can be damaged in transit. Icicles hanging from the roofs of tunnels also can damage the windshields, rear glass and tops of automobiles moving through them piggyback style. The Clinchfield, at least, has encountered this problem and has come up with a solution.

Last summer this road explored the possibility of accepting quantity shipments of automobiles on 87-ft bi-level and tri-level flat cars. One of the critical factors in the handling of this traffic was the need for sufficient clearance through tunnels, of which the Clinchfield has 55 in the 212 miles between MP 7 and MP 219. To ascertain the situation in this respect the road borrowed a clearance car from the C&O and operated it over the line to determine accurately the restrictions imposed on high and wide loads. The findings revealed that the loaded tri-level cars could be handled safely over its main tracks and through the tunnels.

The time required for the manufacture of the tri-level cars made it necessary to defer this traffic until fall. It then became necessary to consider the possibility that icicles hanging from tunnel roofs and ice accumulations at the portals, present from December through March, might cause damage to the cars.

The problem was handed to the engineering department. To remove the ice accumulations a special frame was devised and mounted on a pulpwood car. The latter equipment was selected because it was not in as much demand as flat cars.

The frame is designed to clear the roof of the lowest tunnel by 4 in. Its maximum height above the top of rail is 19 ft 3 in and its maximum width is 11 ft 6 in at a point 15 ft 11½ in above the top of rail. The frame is constructed of open-hearth structural steel fabricated by a combination of welding and high-strength bolts by the road's mechanical department. The frame is removable and will be set off the car during the months it is not needed.

Since the automobile traffic is received from the C&O at the Clinchfield's northern terminal at Elkhorn City, Ky., it must be handled southward in either manifest freight train No. 92 or No. 94. Their departures are such that, to protect this traffic by having an ice-breaker car for each of these trains, three frames are necessary.

These cars are handled in both directions immediately behind the locomotives, thus saving turn-around and classification time at the north and south terminals. The north and southbound schedules are such that an ice-breaker car is operated through each tunnel on the main track every six hours.

Speed Yard Operations at Less Cost with Racor® No. 22 Stand!

The word has been passed in a number of yards: ladders and other areas equipped with Racor No. 22 Switch Stands may be run through. Result: time and money saved by eliminating costly switcher stops and delays.

This husky switch stand will take any number of run-throughs and automatically complete the throw and the proper indication. The hand lever stays where it was.

Even in yards that will not permit switch trailing, the No. 22 stand will save money by eliminating the costs of accidentally damaged switches, rerailing, operating delays, locomotive repairs.

The Racor No. 22 Switch Stand makes switch point adjustment easy, too. Every stand is equipped with a heat treated, forged steel, adjustable crank eye that is actually stronger than rigid types. Accurate adjustments can be made without respiking stand.

If you are interested in speeding up your operations and saving money with this heavy-duty stand, let your Brake Shoe representative know.

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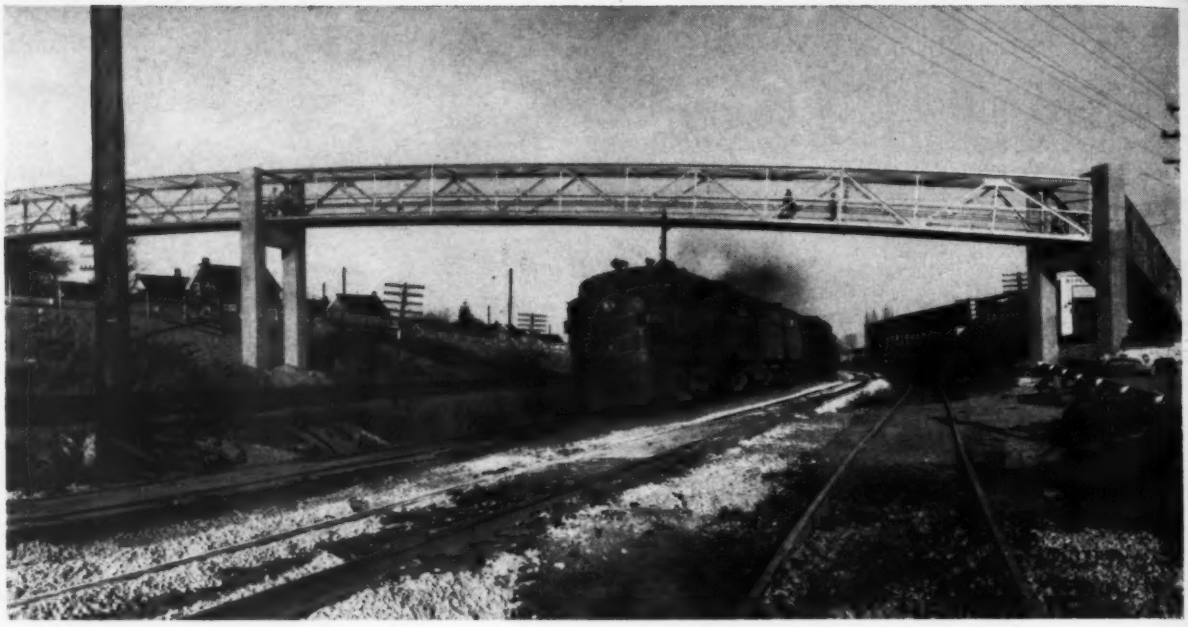


Long footbridge built of aluminum

The new pedestrian overpass erected by the City of Akron, Ohio, in the Kenmore area of the city is said to be one of the longest aluminum footbridges in existence. It is 332 ft long and spans seven railroad tracks. It is comprised of three truss spans measuring 138 ft, 104 ft and 80 ft, respectively, and utilizes more than 40,000 lb of Alcoa aluminum. The light weight of this metal, which allowed economies in erection and pier construction, its resistance to corrosion and minimal future maintenance were said to be the factors that influenced the selection of aluminum for the structure.

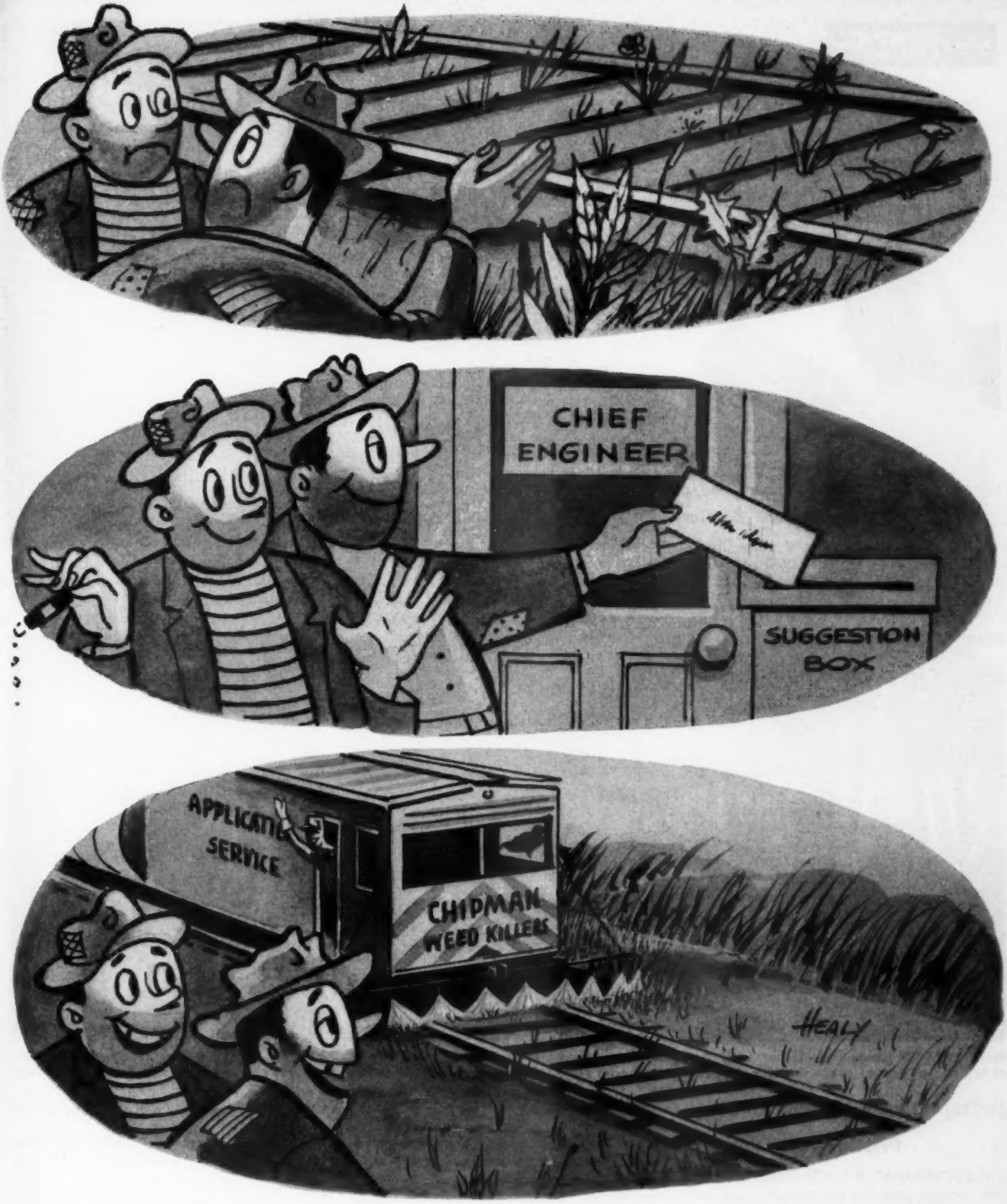
News briefs in pictures . . .

Uses aluminum wire for pole line

Rock Island linemen hurry to complete a new communications line between Goodland, Kan., and Limon, Colo., 107 miles, an area where heavy snow and sleet storms frequently play havoc with pole lines. They are stretching a pair of six-gauge all-aluminum-alloy wires protected by a 2/64-in polyethylene covering. The latter enables them to function even when they are on the ground.

Rail-mounted Jeeps remove snow

A fleet of 23 Jeeps was recently delivered to Erie-Lackawanna maintenance-of-way forces for snow-removal work. The four-wheel-drive Jeep pick-ups are equipped with flanged-wheel, radio-communication and snow-plow attachments. The blades are 7 ft wide. It is anticipated by the road that the units can be used also in summer for leveling earth and for moving sand, ballast and other materials.



PRODUCTS

Pocket transmitter for . . .

Two-way radio

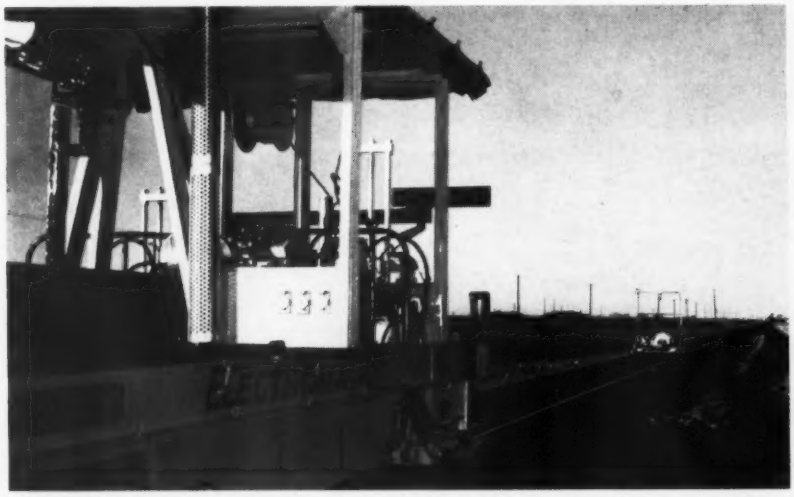
A FULLY transistorized FM radio transmitter is available for operation on standard VHF two-way mobile communication frequencies. Known as the Motorola "Handie-Talkie" pocket transmitter, the unit is designed to operate on frequencies between 25-54 mc and 132-174 mc. It provides 500 milliwatts of RF power output. The pocket transmitter is equipped with 11 transistors to provide high reliability, low power consumption characteristics and compactness. It weighs 14½ oz and measures 5½ in by 2½ in by 1⅛ in.

The new unit is completely self-contained, including microphone, antenna and batteries. It can be operated interchangeably from either nickel-cadmium batteries or mercury cells. Two antennae are available, a solid steel whip and a collapsible whip. The miniature transmitter can be used to communicate with mobile radiophones and/or base stations. It can also serve as a mate to the recently introduced Motorola VHF receiver for providing pocket-sized two-way radio communication. *Motorola, Inc., Communications and Industrial Electroics Division, Dept. RTS, 4501 West Augusta Blvd., Chicago 51.*

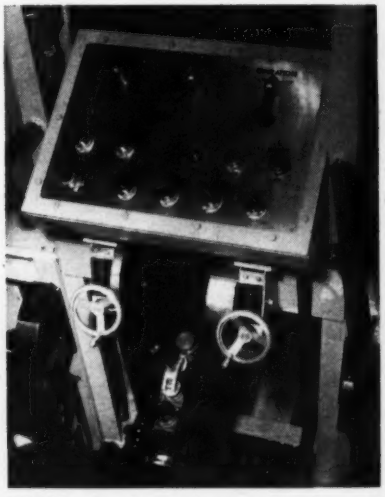
New accessory for . . .

Hydraulic water ram

AN ADAPTER hose is available which enables the portable Hydraulic Water Ram to be used to clear rust and corrosion from hot water lines. The adapter consists of a short length of rubber tubing equipped with a non-slip clamp for attaching to the hot-water faucet and a standard threaded fitting for attaching to the nozzle of the ram. To clear hot-water lines, the adapter hose is secured firmly to the faucet. The ram, which was designed to clear blocked drains or plumbing fixtures by hydrostatic impact through the release of a charge of compressed air, is next loaded to about 150 lb by means of the self-contained hand compressor. The faucet is then turned wide open and the ram discharged. Finally, the ram is disconnected from the faucet and the dislodged rust allowed to flow out. *Hydraulic Manufacturing Company, Dept. RTS Bridgeport 4, Conn.*



ELECTROMATIC tamper equipped with Autojack attachment. Front buggy runs ahead of tamper at end of cable and projects infra-red beam to receiver on rear of machine.



HEIGHT of raise and superelevation are controlled by dials below control panel.

Jacking attachment for . . .

Production tamper

AN ATTACHMENT has been made available for use with the Electromatic tamper, which makes it possible for that machine, with one operator, to perform the functions of "sighting," raising and tamping track. Known as the Autojack the attachment consists of two major components as follows:

(1) A jacking mechanism and "shadow" board mounted on the front of the tamper.

(2) A self-propelled buggy, operating ahead of the tamper, which projects an infra-red beam back to a receiver mounted on the rear of the machine.

The front buggy is propelled by an electric motor through a slip clutch. In normal operation the buggy is kept a predetermined distance ahead of the tamper by a cable that winds on a reel mounted on the machine. The cable serves also as a conductor to provide power for the buggy motor and the beam.

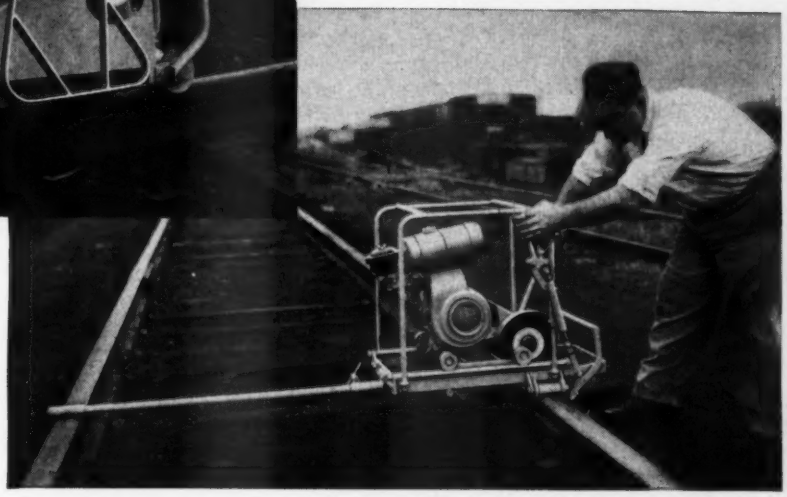
Basically, control of the raising operation is achieved by adjustments that cause the shadow board to cut off the beam when the track has been raised the desired amount, thus stopping the jacks. The tie behind the jacks is then tamped, after which the cycle is repeated.

When an Autojack attachment is applied to an Electromatic tamper two new controls are added, which are placed immediately below the operator's panel. One of these controls the height of the lift and the other the superelevation.

The manufacturer claims that the Autojack-Electromatic combination will do either spot surfacing or make out-of-face lifts of up to 6 in, automatically or manually. Run-ins or run-offs are made automatically, it is said. When making a run-off to a point of fixed elevation, such as a bridge or crossing, the front buggy is placed in a stationary position at the point and the tamper "runs down" the beam.

The manufacturer states that the production of the tamper has not been reduced by incorporation of the jacking device. Speeds in excess of 1000 ft per hour are still maintained, it is said. *Tamper, Inc., Dept. RTS, 85 Margaret Street, P. O. Box 778, Plattsburgh, N. Y.*

MODEL P-45-A PORTABLE RAIL SURFACE GRINDER. Powered by 4-cycle, aircooled gasoline engine developing 7½ hp at 2600 rpm. Adjustable V-belt drive acts as overload release.



MODEL X-60 PORTABLE CROSS GRINDER. Powered by 4-cycle, air-cooled gasoline engine developing 3.4 hp. Hand-actuated lock control lever allows easy alignment with rail joint.

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Sanding devices on M/W equipment

In view of the oil film which sometimes forms on the running rails, on what track machines, if any, would it be advantageous to have rail-sanding devices? Explain.

Not essential

By N. H. Williams
Track Supervisor – System
Delaware & Hudson
Albany, N. Y.

An oil film on the top of rail seldom becomes a problem in the overall operation of track machines. It is a localized condition, aggravated during a light rain because it does materially reduce traction at that time. It is then that sanding devices become a desirable but not an essential feature on a track machine.

Any device used on a track machine should be installed on the basis of necessity and economic justification. Since a sanding device on a track machine is not essential for general operation, because changes in operating procedures during localized periods of poor traction will relieve the situation, it is difficult to economically justify the installation.

Where a track machine is operated under its own power for towing a load, the operator must control the machine in accordance with the rail condition. With poor traction caused by a greasy rail, speed must be reduced so that the equipment can be safely brought to a stop short of an obstruction. Care in applying the brakes is required to prevent the wheels from sliding when stopping. Also, skill in applying sufficient power without spinning the driving wheels when starting is necessary. A few handfuls of grit applied by hand to the top of rail for a few feet ahead of the machine is sometimes an aid to starting under adverse traction conditions. This again, is an infrequent need and not typical of general operating conditions.

The disadvantages of sanding devices on a track machine are obvious. Since the device is not part of the basic design, it would have to be "hung" on the machine. The difficulty with feeding sand because of the sand feeding tube plugging up, caking of the sand in the hopper, the weight of the sand in the hopper, and the maintenance and servicing of the sanding devices are disadvantages that cannot be overlooked.

It is my opinion that the disadvantages of rail-sanding devices on track machines outweigh any benefits that would accrue to the operation of the machines because of the rail-sanding feature. This is especially true on machines that are set off the track for any reason.

Pipes get clogged

By W. N. Taggart
Supervisor M/W Matl. & Equip.
Pennsylvania
Baltimore, Md.

Generally, the use of rail-sanding devices offers minimum advantages when attached to the smaller of the self-propelled, on-track maintenance machines, such as ballast scarifiers, ballast regulators or shapers, production or spot tampers, etc. These units generally work in an area where ties are being renewed or the ballast is generally being disturbed. A certain amount of dust or dirt would be deposited on the rail surface, which would nullify any need for rail-sanding devices.

We have had experience with rail sanders on ballast distributors, using engine exhaust to propel the sand and keep it dry. Difficulty was experienced with condensation between the cold sand and warm exhaust. The time consumed opening clogged sander pipes more than offset any advantages created. The

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● 2. What is your normal work procedure for making a timber trestle ready for pile driving? Describe each step in sequence.

● 3. What causes track to become centerbound? How can this condition be prevented without raising the track each year or two? Explain.

● 4. What is the greatest problem in getting men to fully understand and apply cycle maintenance? What education in this respect would be helpful? Explain.

● 5. When a timber trestle is being replaced with a pipe culvert should the work of placing the fill around the pipe be started immediately? If not, when? What precautions should be taken in placing the fill? Explain.

Send answers to:

What's the Answer Editor
Railway Track & Structures
79 West Monroe Street
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dirt or dust deposited on the rail surface from normal operation generally was sufficient.

Rail-sanding devices are desirable on self-propelled on-track units using standard couplers or equipped with standard or near-standard size and contour rail wheels such as locomotive cranes, undercutters and ballast cleaners, etc. These units depend on their tractive effort to move other units of standard type equipment, heavy-duty push or work trucks or for movement to engage integral attachments to perform its basic function.

It is my opinion, rail-sanding devices are more desirable on the larger, heavier units of track-mounted maintenance machinery rather than on the smaller units designed for portability between job locations.

Is minor problem

By R. H. Miller
Maintenance Engineer
Lake Superior & Ishpeming
Marquette, Mich.

On our road, we often get a thick film of oil substance from leaves falling onto the rail. This presents problems in getting up grades, and in trying to stop when running on-track machinery.

Under normal working conditions, enough sand or dirt from the job being done gets onto the rail so that oil on the wheels is nullified. We do, however, experience some slippage with motor cars and when moving maintenance machinery a long distance. I have seen home made sanders used on smaller machines with moderate success, as long as the operator remembers to keep them filled. In my own opinion, however, the problem is so small that machine operators can occasionally stop, sprinkle a little sand or dirt on each rail, run over it, and be out of trouble for several miles.

Heavy units only

By B. E. Horsman
Junior Assistant Engineer
Canadian National
Montreal, Que.

For the smaller track machines, such as tampers, liners, etc., wheel-slip due to traffic film is not a problem. Slip due to oil from the machines themselves certainly could be remedied by the use of sanders but this immediately poses several problems. The two most important of these are the cost of a sanding system as compared with the cost of the machine, and the trouble and expense involved in supplying sand to the machines. This problem of supply becomes a big one when track machines work for months at a time without passing through a terminal where sanding facilities are available.

While sanders would overcome the problem, a more satisfactory solution would be to keep the machine oil from getting on the rail in the first place. This could be done by making machine operators aware of the problem, thus having them keep gasket and hose connections tight. Reservoirs and oil cups would have to be filled carefully to avoid spilling. Where leaks persist, simple sheet-metal guards could be installed to deflect oil from the rail.

The problem of wheel-slip on larger machines, such as locomotive and diesel-electric cranes, is something else again. Traffic film and even wet rail will often cause wheel-slip when this type of equipment is used to move cars. Sanding devices are, therefore, a must.

On larger machines, the problem of sand supply is minimized since the equipment is seldom away from sanding facilities for extended periods of time. These larger machines would also allow increased sand-storage capacities.

To sum up, sanding devices would be impractical and are, in fact, unnecessary on small on-track machinery. However, they are required on larger machines which are used to move cars.

Tuck-pointing masonry

What factors determine when it is necessary to tuck-point masonry structures? What is the proper procedure relative to the selection, mixing and application of the materials for assuring a durable tuck-pointing job? Explain.

Build on solid mortar

By W. G. Harding
Architect
Wabash
St. Louis, Mo.

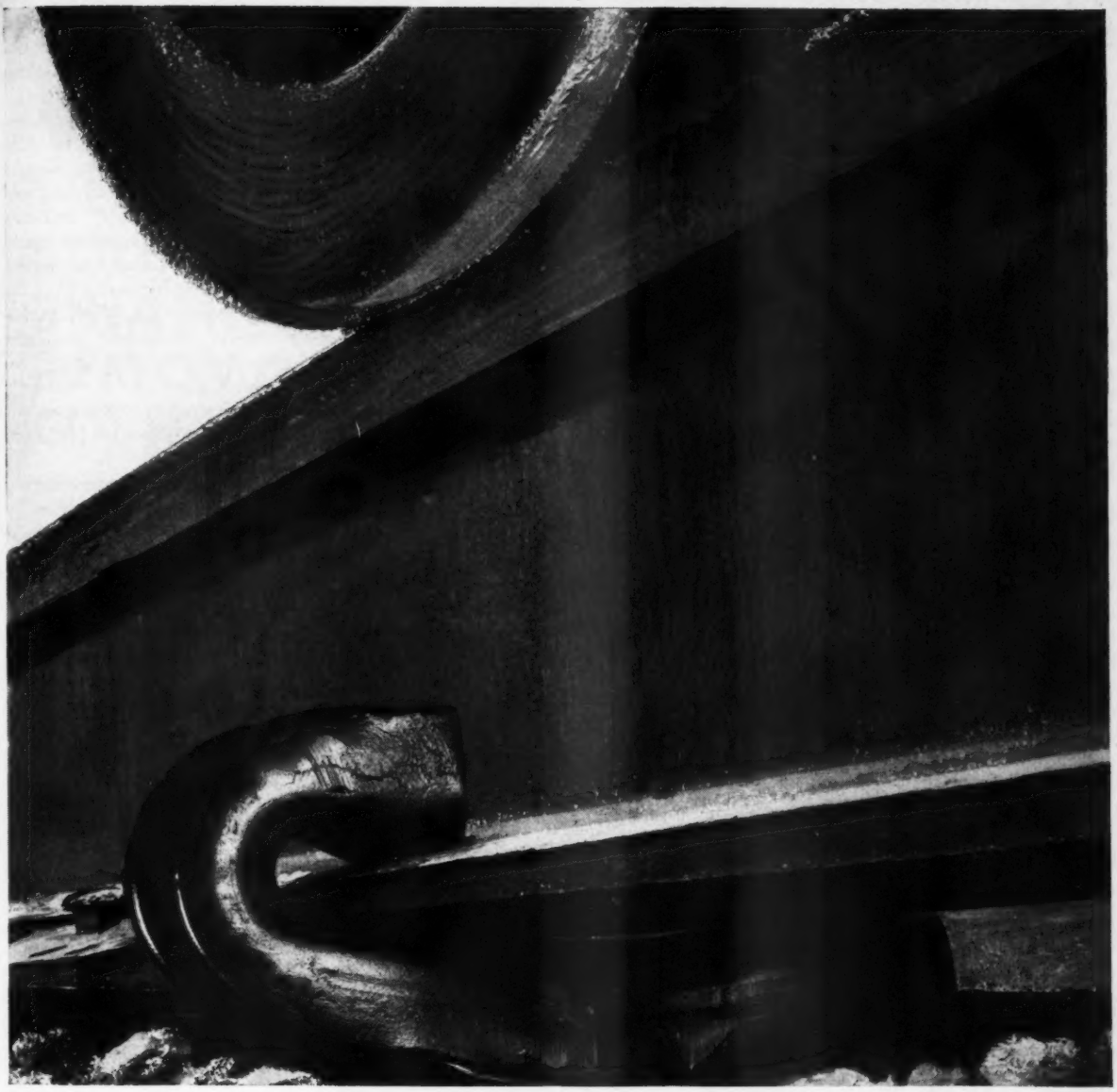
Tuck-pointing of masonry structures is necessary when there is a breakdown of mortar joints between the masonry units, permitting the passage of moisture from the exterior of the wall to interior surfaces. Although the interior walls of solid masonry structures may become damp when subjected to rain for long periods of time, massive leaking occurs through hair-line shrinkage cracks or openings between the masonry and mortar or deterioration of the mortar joints.

The cause of shrinkage cracks has been the subject of discussion by various authorities. Some contend that they are caused by a loss of water in the mortar by suction, resulting in a bridging action, while others contend that the suction of water from the mortar causes a dust crack to form between the top of the brick and bottom of the mortar joint because of lack of water to properly hydrate the mortar.

Mortar joints are also broken down by other actions, such as weather erosion, leeching action of rainwater causing removal of soluble components of the mortar, the formation of weak sulphurous acid when smoke from high sulphur-content coal comes into contact with moisture in the joint, and the alternate freezing and thawing cycles experienced during severe winter weather.

Last but not least of the factors making tuck-pointing necessary is the quality of workmanship performed on the masonry walls. Poor workmanship in any phase of masonry construction is a prelude to trouble from leakage.

When tuck-pointing of a masonry



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wall is undertaken, all loose, deteriorated or otherwise defective mortar should be raked out of the joint for approximate ¾ in, or until solid mortar is reached. When the cutting is completed, all dust and loose material must be removed by brushing, or preferably with a water jet. If water is used in cleaning the dust from the joints, no additional wetting may be required. However, repointing should not follow immediately after the joints are washed and little, if any, wetting will be necessary when the walls are constructed of low-absorption units.

Mortar for tuck-pointing should be mixed at least two hours before use with only a portion of the mixing water to permit pre-hydration. At the end of the curing period the mortar must be reworked, adding the remainder of the water. In this manner, initial shrinkage is eliminated and workability improved. The mortar should then be thoroughly packed in the joint in thin layers and tooled to a smooth, compact, concave surface.

Use the best mortar

By W. S. Brown
Engineer Bridges & Buildings Maintenance
Baltimore & Ohio
Baltimore, Md.

In laying masonry of any character, the exposed edges of the joints will naturally be deficient in density and hardness. Therefore, it is usual, after the masonry is laid, to refill the joints by tuck-pointing. Before the mortar has set in beds and joints, it should be removed to a depth of not less than 1½ inches. Pointing should not be done until the wall is complete and mortar set; nor when frost is in the stone.

Special attention should be given the maintenance of the pointing. Failure to maintain the pointing in masonry structures results in the loosening, displacement and cracking of the masonry, allowing the entrance of moisture and indicating destructive frost action. This is particularly true with stone masonry.

There are some instances where tuck-pointing is not practical and the shotcrete method of pointing should be used. For instance, in stone masonry where the mortar has disintegrated to approximately 4 in or more, it becomes difficult to properly pack in the mortar by tuck-pointing, but can be done successfully by the shotcrete method. In brick masonry, if the brick sounds drummy when being tapped, the structure is beyond any pointing method.

Except in new construction, pointing can be best and most economically accomplished in most cases by the shotcrete method. However, one disadvantage in pointing by the shotcrete method is that it leaves the masonry discolored and unsightly. If so desired, the discoloration can be cleaned off. However, on the railroad the physical appearance is generally not of the utmost importance.

The very best mortar should be used for pointing, as the best becomes dislodged all too soon. Pure Portland cement mortar is best; although one volume of Portland cement to one of sand is frequently used in first-class work. Sand should be clean, sharp and screened, entirely free from loam, clay or other impurities. The mortar, when ready for use, should be rather incoherent and quite deficient in plasticity.

Before tuck-pointing, all defective mortar should be raked out and thoroughly flushed with water under pressure. The use of water is particularly desirable in washing out mud and silt deposited by high water.

The joints being previously cleaned out, the mortar is put in by trowel, a straight-edge being held just below the joint. The mortar is then well calked into the joint by a calking tool; then more mortar is put in and calked until the joint is full. It is then rubbed under as great a pressure as the mason can exert and finished with a beading tool the width of a joint. If the joints are very fine, they should be enlarged by a stone-cutter to about ¼ in to receive the pointing. The joints should be well wetted before the pointing is put in, and kept in such condition as neither to give water to, nor take it from, the mortar. In hot weather, the pointing should be kept sheltered for several days from the sun, so as not to dry too quickly. Likewise, the pointing should be kept from freezing in cold weather.

Locating jetties along streams

How should jetties be located in silty or sandy stream beds to control channel and high-water currents during floods, as well as to protect the banks from scour? Describe the procedure in detail.

Uses riprap blanket

By H. F. Moy
Secretary to Ch. Engr.
Spokane, Portland & Seattle
Portland, Ore.

The SP&S has never had occasion to build what could be considered a jetty. The streams adjacent to our railroad run quite fast, fluctuate a great deal in water level, and tend to create large waves due to wind action.

We have protected all of our slopes with a heavy riprap blanket in lieu of constructing jetties adjacent to our embankment sections. I feel that in bank protection the knitting of the rock together is very important so that the water and wave action will not have a chance to move them out of place. The steeper the fill slope the larger the rock should be. In all cases voids between the larger stones should be well chinked by smaller ones so as to prevent a sucking action on the finer grain materials directly behind the riprap section. Also, a layer of fine rock should be placed on an earth fill before the placement of the larger rock to act as a filter to keep the common material from being sucked out as mentioned.

The greatest concern of the SP&S is over 200 miles of embankment sections along the Columbia river.

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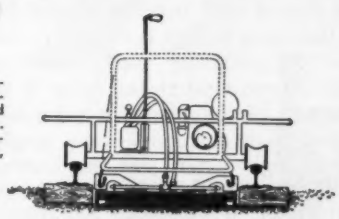
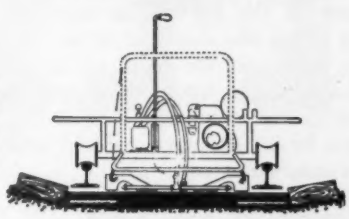
The WOOLERY Tie-End Remover consists of a double-ended hydraulic cylinder which drops into the tie bed left by removal of the center section. Note that there has been NO trenching or jacking! Keeps track smooth, safe!



A simple turn of the valve shoves the tie-ends outward—completely clear of the rail, pushing ballast ahead of it to open crib for the new tie! Hydraulically powered pistons work equally well and fast with single or double shoulder tie plates.



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The chief problem along this area is wave action from severe winds occurring about nine months of the year. We have built numerous types of embankment sections and protected them with rock. Most of the failures have occurred from rock dumped down the slopes of the embankments, and also to foundation failures.

From past experience we have found that the only way to be reasonably sure that the rock protection will stay in place is to build an embankment section as follows: Build a well-compacted embankment out of granular material on a stable foundation. If the foundation materials are unstable they should be removed. The part of the embankment which is to be protected should be on a minimum of a 2:1 slope. After the embankment is finished, a 2-ft layer of coarse gravel or small rock is spread over the entire surface of the slope before the riprap is placed. Then the riprap is placed by using a dragline or clamshell bucket. The larger rock is distributed evenly and the voids chinked with the smaller stones.

The size of the rock and thickness of the shell is determined by the height of the waves. If the waves are 5 ft or under, the horizontal thickness of the blanket is 5 ft and the size of rock from 50 to 1000 lb. If the wave height is over 5 ft, we use rock weighing 100 to 5000 lb and a horizontal thickness of 7 ft. The top of the riprap is 1½ times higher than maximum wave height above high water, and the bottom of the protection is a minimum of 5 ft or one wave height below low water. If the top of the riprap is well below the shoulder of the railway subgrade, we build an access road along the top of the riprap so that, in the event any rock is lost, it can be immediately replaced with off-track equipment.

Uses steel jetties

By R. N. Schmidt
Division Engineer
St. Louis – San Francisco
Enid, Okla.

The question as to how to place jetties and where to locate them in silty or sandy streambeds to control channel and high-water currents during floods, as well as to protect the banks from scour, is one which many of us have been required to answer many times. This is especially true in the Southwest where most of our streams have sandy beds. Frequently the rivers or creeks do not have definite or well-defined banks and, if they do, they are so widespread that they allow the stream to meander a considerable distance each way before being stopped by definite banks which offer resistance and retain the stream.

This meandering of a stream in a sandy location makes it extremely difficult to maintain the stream so that it will flow consistently under a bridge or reasonable length or within a limited channel. The river or creek with a sandy streambed constantly threatens to wash out bridge ends and to go around a bridge by following an old channel. If not contained, it will tend to scour banks and endanger tracks or roads paralleling the stream.

Of course, the earlier the scour or channel change is noted the less costly and extensive will be the work necessary to correct it. In sandy or silty streambeds, such as we have in the Southwest, one of the most effective corrective measures may be obtained by the use of steel jetties. Steel jetties are constructed of angle irons of various sizes and weights depending upon the particular conditions involved. They usually consist of two sizes; the heavier angle used in the jetties in what would be called the main line, and the lighter-weight angles which are used in the back-up lines.

The main lines of jetties should be placed across the scour, parallel to the normal channel. This main line of jetties should be placed out a sufficient distance from the remaining bank to where the bank was previous to the scour, or at the edge of a reasonably desired channel. This main line of jetties, cabled together parallel with the stream, must extend far enough upstream and below the scoured location so that the next rise will not cut in behind or go around. This main line is then backed up with jetties of lighter-weight construction extending at an angle from the main line to the permanent and undisturbed bank beyond the scour.

As preparatory work prior to the installation of the back-up lines, the back slopes or the edge of the scour should be shaped to a gradual slope from the top of the bank to the water. These back-up lines should be placed at a slight angle, slanting slightly upstream from the main line. These secondary or back-up lines are usually spaced at 50-ft intervals along the main line and may be spaced closer depending upon the size of the stream.

If the stream is directed on the main line with considerable force, it may be necessary to have a double line or two main lines of jetties paralleling the desired channel. Both the main lines and the back-up lines should be sufficiently anchored to dead men buried above the scour to secure their position. This of course is understandable, as the principle of the steel jetties is that they will uniformly retard the velocity of the water that flows through them to such an extent that the water cannot pick up soil, but instead will deposit the soil it is carrying.

If the water tends to undercut or scour under the jetties, the jetties will settle to the bottom, continuing to retard the velocity and scour, and start the silting deposit action. Usually where the stream has scoured a bank, changing the channel to a new location, the old channel will fill with sand and may build a sand bar of considerable size. We then get back to the principle of the steel or permeable type of jetty, which is: If the velocity of the stream is retarded in one place it is increased at another. Thus the stream will cut out the sand bar opposite the scour and return the stream to the desired channel. By reducing the velocity of the stream at the scour and encouraging the rebuilding of the desired embankment, the stream will cut as much of the sand bar away as necessary to provide an adequate channel.

After the deposits have built up or the jetties have dropped down, it will be necessary to replace those jetties which are no longer effective. Of course the built-up soil soon supports vegetation and growth which will further expedite repair and permanent embankment. The purpose of the permeable-type jetty is not to divert the stream, but, by proper positioning, to induce silting deposits and controlled cutting and to

What's the answer? (cont'd)

return or contain a stream within desired limits.

It must be emphasized that an inadequate jetty installation will not provide effective control or correction. The required number of units cannot be reduced if desired results are to be obtained.

At slight angle

By D. Danyluk
Division Engineer
Canadian Pacific
Nelson, B. C.

The corrosive power or scour of river water varies as the square of the velocity of the stream. Each problem of scour which may develop along the banks of silty streams should be dealt with separately. I have been unable to locate a theoretical solution to this type of problem which in my opinion can be solved only by initiating corrective measures based on experience.

The scour of river banks may be controlled by placing rock jetties extending at a slight angle from the river bank in fast-moving streams, and increasing this angle in slow-moving streams, to deflect the water from the bank. These jetties should not be extended too far into the stream, as the cross section of the stream bottom should not be reduced appreciably. The height of the jetties need only extend to the average high-water level to control the scour which is at its maximum near the lower end of the slope of the bank and is near zero at the stream surface.

The jetties may be constructed by fabricating cribs from scrap rail and filling with rock, or by using wire-type baskets which are now on the market. Timber-frame cribs may also be used.

They should be of ample width to withstand the stream pressure. The number of jetties required at any particular location can only be based on previous experience and good judgment. Instead of jetties, angular slag rock, 3 in plus if available, and of high enough specific gravity, may be used as riprap along the bank where scour is experienced. The rock should extend to the bottom of the slope. Reasonable success can be achieved to restrict

scour when this type of rock is properly placed. For more permanent results, jetties and riprap should be used.

Parallel with track

By W. R. Bjorklund
District Engineer
Northern Pacific
St. Paul 1, Minn.

We have found that the same amount of rock which would be required to construct a jetty or system of jetties for controlling a channel can be more readily placed as paralleling riprap. Riprap in general should be placed parallel with the track at the upstream end of the eroded channel so that it may be continued upstream in a relatively straight line. Downstream where the channel tends to swing away from the track, it is recommended that the riprap be placed along the bank, or curving away from the track to discourage continued erosion.

In general, most streams will degrade in silty or sandy soils about one-half of the maximum rise in water surface. In other words, a 10-ft rise in water surface during floor stage would probably result in a degradation of 5 ft to the streambed. This will serve as an approximate estimate of the depth to which paralleling riprap should be trenched in order to support the subsequent riprap placed along the bank. It is essential that a satisfactory toe be installed in order to eliminate any chance for undermining the riprap and losing its value.

We have found that, if the riprap can be placed at extreme low water stages, and excavation along the bank wasted to form a small dike in the channel during freeze-up, we can excavate an adequate trench sufficiently deep so that there is no danger of it becoming undermined. The largest available riprap should be installed in forming the toe, and the subsequent riprap placed on a reasonably smooth earth surface up the bank.

If there is to be considerable floating debris or large ice cakes in the river during the spring of the year, the riprap can be more easily maintained if it is hand placed, or at least semi-hand-placed, to reduce to a minimum the danger of floating objects dislodging the rock. Where floating debris and ice are not prevalent, normally dumped riprap should be satisfactory, provided the slope is sufficiently flat and the toe has not become undermined.

One of the difficulties with jetties is that individuals owning land on the far side of the stream might claim damages due to diverting the flow of river, and then, too, the jetties must be installed sufficiently close together to protect against eddy currents on the downstream side.

We have found that, where the rock can be rough placed readily along the bank, considerable improvement can be realized by brooming concrete over the surface to provide a reasonably smooth surface to discourage the dislodgment of rocks due to floating debris and ice. Where ready-mixed concrete is readily available, it will normally be cheaper to sluice concrete over the surface of rough-placed surface than to go to the expense of hand placing the rock to a smooth surface.

Field cutting hydraulic hose

What is the best way to cut heavy hydraulic hose used on track machines in the field? How are the fittings connected? Explain.

Carries extra lengths

By Earl W. Knight
General Foreman Track
Pennsylvania
Marion, Ind.

We use Aeroquip hose on our machinery. The best method I have found to cut it in the field is by using a grinder with a cross-grinding stone ⅛ in thick. A heavy hydraulic hose can be cut in seconds this way and it makes a smooth job. Also, a grinding stone can be used to grind the heavy rubber off the outside of the hose so that the fittings will go on. After cutting, the hose must be cleaned inside and out with air pressure, as dust from the stone will damage a hydraulic system.

To connect the hydraulic fittings in the field, the part that goes on the end of the outside of the hose is clamped in a vise, the hose is inserted and turned to the left until it is all the way in. It is then backed up three-quarters of a turn to the right. The tapered male or female fitting is then inserted inside of the hose, care being taken not to cut the rubber inside the hose, and tightened to the right. It also helps to grease the tapered fitting before inserting it in the hose.

I use the above method only in emergencies because it is a very difficult job. Most gangs do not have the proper equipment to handle this heavy hose, which sometimes results in a poor job.

From experience, I have found that, by carrying extra hose and fittings properly made up ahead of time, it has saved breakdown time.

When I receive machinery that I am not familiar with, I measure all the hose lengths and sizes, and note the types of fittings used, and call this information in to our heavy-equipment repair shop. Extra hoses are then made up. Since the shop is equipped with a machine to put

these fittings on properly, a good job is assured. I sometimes find that one hose will fit on two or three different machines.

Standard hack saw

By PAUL MARTIN
Methods Engineer
New York Central System
Cleveland, Ohio

When hydraulic power was first used on machines, one of the early weaknesses of this source of power was the inability to make field repairs to hose that had failed. At the present time, two well-known manufacturers of hydraulic hose and fittings make field repairs quite simple. One firm does require the use of various size mandrels to attach their fittings to the hose, while the other firm's fittings can be applied to a hose by the use of hand wrenches, or a vise and wrenches. A vise attached to a large machine will prove invaluable, especially when working on the larger hoses.

Our mechanics' trucks, which we refer to as mobile shops, are well equipped to handle the cutting, disassembly and assembly of hydraulic hoses. However, the information contained herein considers the single unit which, most of the time, is working alone and away from the facilities of the shop or a mechanic's truck.

The standard hand tool used to cut hydraulic hose in the field is the hack saw. By using a fine-tooth blade, similar to a blade used in sheetmetal work, an acceptable cut can be made through all types of hydraulic hose. This type of hacksaw blade is usually good for four or five cuts depending, naturally, on the diameter of the hose.

This will also be an opportune time to stress the necessity of cleanliness when any part of a hydraulic system has been opened to make repairs. Exposed hose and pipe ends, as well as exposed inlet and exhaust ports on hydraulic pumps and motors, should be capped immediately to exclude foreign matter that would be injurious to the hydraulic system. A newly assembled hose should be flushed with diesel fuel, or similar fluid, before installing the hose in the hydraulic system.

Biographical briefs

(*Continued from page 6*)

1946 as a laborer. In 1951 he was promoted to track supervisor at Greenwood, S. C., subsequently serving in that capacity at Winston-Salem, N. C., Salisbury, Greensboro, and Atlanta, Ga. Mr. Chambers was further promoted to assistant division engineer at Atlanta, Ga., in 1957. He was serving in that capacity at Knoxville, Tenn., at the time of his recent promotion.

Basil E. Buterbaugh, 34, who was recently promoted to special engineer of the Frisco at Springfield, Mo. (*RT&S*, Oct., p. 10), was born at Carthage, Mo., and graduated from the Missouri School of Mines in 1950 with a Bachelor of Science degree in mining engineering. Mr. Buterbaugh entered the service of the Frisco in 1948 as a rodman at Fort Scott, Kan., being promoted to instrumentman there in 1949. He was further promoted to assistant engineer at Springfield in 1955 and assistant superintendent of construction at Tulsa, Okla., in 1957. Mr. Buterbaugh was advanced to construction engineer there the following year, the position he held at the time of his recent promotion.

Henry F. Kilpatrick, 39, who was recently promoted to track supervisor on the Southern Pacific at Hachita, N. M. (*RT&S*, Sept., p. 10), was born at Nacona, Tex. He entered the service of the SP in 1941 as a laborer and machine operator, being promoted to extra gang foreman four years later. In December 1945 he entered military service with the U. S. Army, serving in an engineer construction battalion. Six months later he returned to the SP as a section foreman. He was serving as extra gang foreman at the time of his recent promotion.

John E. Mardis, 53, who was recently promoted to track supervisor on the Louisville & Nashville at La Grange, Ky. (*RT&S*, Sept., p. 10), was born at Asheville, N. C. He entered the service of the L&N in 1926 as a water boy at London, Ky., serving also as section laborer there. He was appointed machine operator in 1939. During World War II he served with the 728th Railway Operating Battalion in the European Theatre of Operations. In 1946 he was appointed section foreman at Berea, Ky. Mr. Mardis was promoted to assistant track supervisor at Latonia, Ky., in 1954, the position he held at the time of his recent promotion.

James E. Sunderland, Jr., 34, who was recently promoted to supervisor maintenance equipment on the Baltimore & Ohio at Baltimore, Md. (*RT&S*, Oct., p. 10), was born at Baltimore and graduated from the University of Maryland in 1952 with a Bachelor of Science degree in civil engineering. He entered the service of the B&O in 1952 as a technical trainee, being promoted to assistant to division engineer at Cumberland, Md., two years later. Mr. Sunderland was further promoted to assistant division engineer at Pittsburgh, Pa., in 1955. He was serving in that capacity at Akron, Ohio, at the time of his recent promotion.

Michael D. Kenyon, 24, who was recently promoted to roadmaster on the Denver & Rio Grande Western at Grand Junction, Colo. (*RT&S*, Sept., p. 10), was born at Glendale, Calif., and graduated from the Massachusetts Institute of Technology in 1958. He entered the service of the D&RGW in 1958 as a section laborer at Bond, Colo. Two months later he was promoted to engineering assistant at Denver, Colo. In January 1959 he entered military service with the U. S. Army, serving with the Corps of Engineers at Fort Belvoir, Va. Mr. Kenyon returned to the D&RGW seven months later and was appointed track supervisor at Denver. He was serving in that capacity at Kremmling, Colo., at the time of his recent promotion.

A. Myron Olson, 48, who was recently promoted to general roadmaster on the Milwaukee Road at Chicago (*RT&S*, Oct., p. 10), was born at Horton, Mont. Mr. Olson entered the service of the Milwaukee in 1929 as a section laborer at Baker, Mont., being promoted to section foreman there in 1932. He was further promoted to extra gang foreman in 1934 and roadmaster at Mobridge, S. D., in 1940, serving also in that capacity at Lewistown, Mont. Mr. Olson was advanced to assistant general roadmaster at Chicago in 1959, the position he held at the time of his recent promotion.

Joseph L. Goss
NP

A. L. Fridley
Unit Rail Anchor

Joseph L. Goss, 52, who was recently promoted to engineer water service, power and heating of the Northern Pacific at St. Paul, Minn. (*RT&S*, Sept., p. 10), was born at Savanna, Ill., and received his higher education from Marquette University. He entered the service of the Northern Pacific in 1941 as a water inspector. Mr. Goss was advanced to chief chemist, water service, in 1947 and supervisor power and heating in 1958, which position he held until his recent promotion.

Supply Trade News

ATHEY PRODUCTS CORP.—Wesley L. Kubik, vice president, manufacturing, has retired but will be retained in an advisory capacity as a production consultant for a year. **Keith V. Gilbert** has been named assistant to the sales manager.

ATLANTIC TRAILER CORPORATION—The **Ralph W. Payne Company,** Washington, D. C., has been appointed representative of this company to railroads in the southeastern region of the United States.

CHIPMAN CHEMICAL COMPANY, INC.—This company has announced the establishment of a new sales district including the states of Minnesota, North Dakota, South Dakota and part of Wisconsin. **Donald Horne** has been appointed manager of the new district and will have offices at 786 North St. Albans street, St. Paul, Minn., where the company also has a manufacturing plant. Mr. Horne has been with the company for over six years serving the agricultural

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trade and more recently as railroad sales representative in the area encompassed by the new district.

REPUBLIC CREOSOTING COMPANY—This company has merged, effective January 1, with its wholly owned subsidiaries, Reilly Tar & Chemical Corp. and Char Products Company, according to a recent announcement. The merged company will be known as Reilly Tar & Chemical Corp. The announcement stated that wood preservation operations will be handled as a separate unit under the name of Republic Creosoting Company, Division of Reilly Tar & Chemical Corp.

TAMPER, INC.,—**Robert J. Moe** and **John W. Rapp** have been appointed district managers at Minneapolis, Minn., and St. Louis, Mo., respectively. **W. A. Blackford** has been appointed district representative with headquarters at San Francisco, Calif.

UNIT RAIL ANCHOR CORPORATION—A. L. Fridley has been appointed district sales manager with headquarters at Chicago. Mr. Fridley succeeds the late **Nealy A. Howell,** whose death on December 10 was announced in the January issue.

Association News

Mississippi Valley Maintenance of Way Club

"Factors Determining Standards of Maintenance" will be the subject to be discussed at the February meeting which will be held on the 13th at the Ambassador Hotel, St. Louis. The speaker will be F. L. Etchison, chief engineer, Western Maryland.

Maintenance of Way Club of Chicago

At the next meeting of the club, to be held on February 27, the speaker will be John S. Parsons, chief engineer of the Erie-Lackawanna. His subject will be "Mergers—How They Affect the M/W Department." Mr. Parsons can speak with authority on this subject because of the recent merger of the Erie and the Lackawanna.

The meeting will be held at the Midland Hotel, 172 W. Adams St., Chicago, with dinner starting at 6:30 pm.

Northwest Maintenance of Way Club

Ray McBrian, director of research, Denver & Rio Grande Western, will be the speaker at the next meeting of this club. It will be held on February 16 at Coleman's Cafe, 2239 Ford Parkway, St. Paul, with the social hour starting at 5:30 pm and dinner being served at 6:30. In his address, which will be illustrated by slides, Mr. McBrian will recount observations of railroad practices he made during a trip to Europe in the fall of 1959. He will give particular attention to developments bearing on practices, materials and machines used in railway maintenance.

(Please turn the page)

National Railway Appliances Association

Indications are that all available space will be occupied at the NRAA exhibit to be held at McCormick Place, Chicago, in conjunction with the AREA convention. At press time, a total of 99 companies had been assigned exhibit space amounting to 95 per cent of the available booths. The exhibit will open on Monday, March 6, a day before the start of the AREA convention, and will continue throughout the three-day meeting. Each day the exhibit will open at 8:30 am. It will close at 5:00 pm on Monday, 6:00 pm on Tuesday and Wednesday and 1:00 pm on Thursday. A continuous shuttle bus service, to operate between the Conrad Hilton Hotel (designated the convention headquarters hotel) and McCormick Place, will be provided by the NRAA during the hours of the meeting and exhibit.

Skeleton Program for AREA annual meeting

The annual meeting of the American Railway Engineering Association will be held on March 7-9 at McCormick Place, Chicago's new lakefront exposition center at 23rd Street. Concurrent with the AREA's annual meeting the National Railway Appliances Association will sponsor an extensive exhibit also at McCormick Place. In addition to the general sessions, the annual luncheon and all committee luncheons will be held at McCormick Place. As indicated in an adjoining column a shuttle bus service will be provided between the Conrad Hilton and McCormick Place. A luncheon for wives of members will be held on Wednesday at the exposition center.

A skeleton program of the meeting follows:

Monday, March 6

Pre-convention registration 9:00 am—3:00 pm, McCormick Place

Tuesday, March 7

Registration, 8:00 am—3:00 pm, McCormick Place

(Banquet Room, 9:30-12:00)

Address by President E. J. Brown
Report of Secretary and Treasurer
Keynote address by C. D. Buford, Vice President, Operations and Maintenance Dept., AAR
Address by W. M. Keller, Vice President, Research Department, AAR

(Banquet Room, 1:30-5:30)

Reports of Committees
20—Contract Forms
11—Engineering and Valuation Records
28—Clearances
25—Waterways and Harbors
13—Water, Oil and Sanitation Services
14—Yards and Terminals
16—Economics of Railway Location and Operation

Wednesday, March 8

(Assembly Hall, 9:00-11:55)

Reports of Committees
24—Cooperative Relations with Universities
7—Wood Bridges and Trestles
8—Masonry
30—Impact and Bridge Stresses
15—Iron and Steel Structures
29—Waterproofing

ASSOCIATION LUNCHEON—12:00 NOON

(Banquet Room)

Announcement of results of election of officers
Address by H. C. Murphy, President, Burlington Lines

(Assembly Hall, 2:15-5:30)

Reports of Committees
9—Highways
18—Electricity
6—Buildings
17—Wood Preservation
3—Ties
22—Economics of Railway Labor
27—Maintenance of Way Work Equipment

Thursday, March 9

(Banquet Room, 9:00-12:30)

Reports of Committees
1—Roadway and Ballast
5—Track
4—Rail
Special Committee on Continuous Welded Rail
Closing Business
Installation of Officers

Helps From Manufacturers

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

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BATTERIES. A bulletin is available which describes and illustrates Eveready Air Cell batteries for aid-to-navigation lights, railroad switch lamps, emergency lighting and communication equipment. Designated catalog section R-9555, the bulletin lists the features of air-depolarized batteries and points out the advantages of their use. Two tables are included which give information on voltage rating, ampere-hour capacity, dimensions, dry weight and recommended maximum current drain for both continuous and intermittent service. (Write: *National Carbon Company, Dept. RTS, 270 Park Ave., New York 17.*)

CRANE-EXCAVATORS. The features and general specifications of the Schield Bantam line of Series 350 crane-excavators are given in a new bulletin. Designated 350-2, the bulletin also includes complete capacity charts and work ranges on the 11-ton carrier-mounted Model T-350, 11-ton self-propelled Model CR-350 and 8-ton crawler-mounted C-350. In addition, the bulletin gives specifications on the complete line of 6 Bantam-built crane carriers and front-end attachments, including clamshell, dragline, pile driver and tamper, backhoe and shovel. (Write: *Schield Bantam Company, Dept. RTS, Waverly, Iowa.*)

RUST PREVENTION. Oakite Service Bulletin No. 16B is available which describes procedures and materials for attacking rust. Procedures described include removal of rust from raw stock by the use of inhibitors or inhibited acid compounds, removing rust in an alkaline solution and preventing rust formation while parts are being processed and stored. In addition, the bulletin describes the Oakite CrysCoat process for preparing steel for painting. (Write: *Oakite Products, Inc., Dept.* RTS, 19 Rector St., New York 6.)

WHEELED TRACTOR. A 12-page booklet is available which describes and illustrates the Caterpillar 922 Series A Traxcavator. Designated 34004, the booklet points out the features of the machine, including gasoline and diesel engines, new hydraulic system, power-shift transmission, automatic bucket positioners, 41-deg bucket breakout for heaped loads and easier access to components for servicing. Specifications, dimensions and lifting capacity at various bucket heights are given. (Write: *Caterpillar Tractor Company, Dept. RTS, Peoria, Ill.*)

WELDING TORCHES. Oxweld W-45 and W-47 mixer-type welding torches are described and illustrated in a new eight-page booklet. The booklet, Form 55-005, points out the ability of the torches to weld various thicknesses of metal, from 28-gauge sheets to heavy plates. Operating data, specifications and ordering information are included. In addition, the booklet gives information on welding and heating heads and cutting attachments and nozzles. (Write: *Linde Company, Division of Union Carbide Corporation, Dept. RTS, 270 Park Ave., New York 17.)*

PROTECTIVE COATINGS. A new eight-page bulletin is available which describes the corrosion protection features of the Koppers line of cold-applied bitumastic protective coatings. Designated T-97-61, the bulletin points out the properties of nine bitumastic products and gives specification data for each. A table is included which lists the recommended coatings for various types of installations. Three pamphlets are also available which describe three of the bitumastic coatings in the line. Pamphlet T-197-1 describes Bitumastic 11-S inhibitive primer, T-197-2 describes Bituplastic 33 and T-197-3 describes Bituplastic 44. The three pamphlets are the first of a series of 11 brochures scheduled to be published on cold-applied protective coatings. (Write: *Koppers Company, Tar Products Division, Dept. RTS, Pittsburgh 19, Pa.*)

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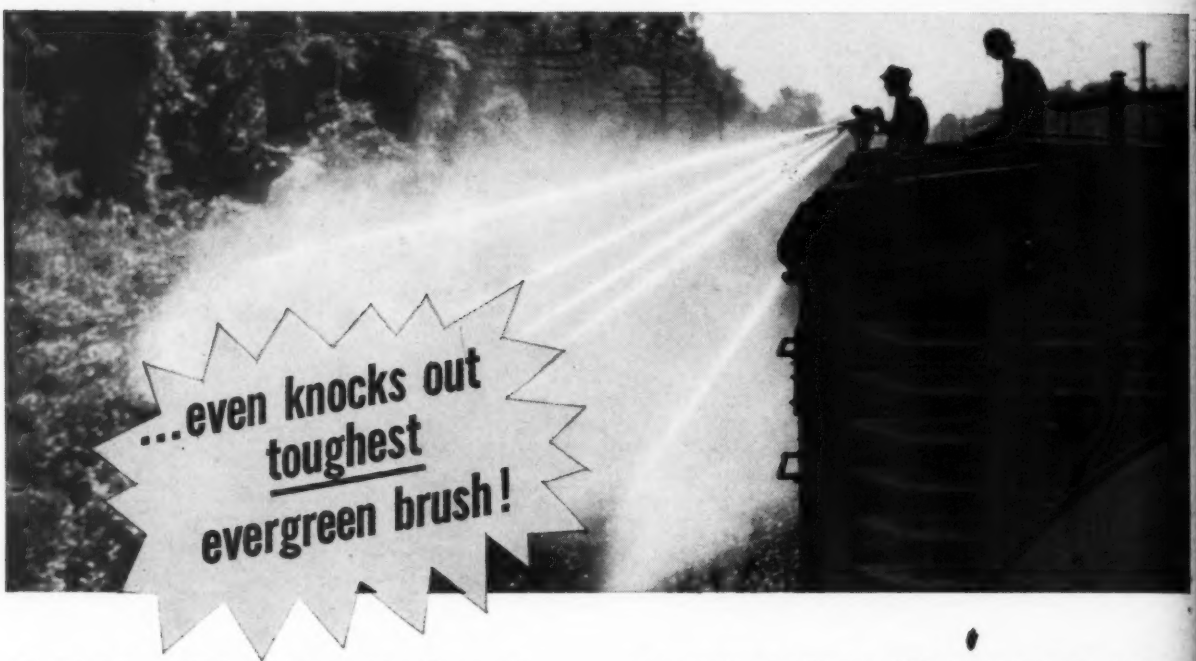

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